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Monthly Message

Sometime ago I heard a sermon which still lingers in my mind not only because it was a good sermon, but also because of the profoundness and eternal verity of its text: "To everything there is a season and a time to every purpose under the Heaven," Ecclesiastes III-1. The writer of Ecclesiastes was called "The Preacher."

A purpose of every sermon should be to provoke thought, yet unfortunately such is not always the case: perhaps the fault lies with the preacher, or perchance due to the drowsiness or wandering thoughts of the listener:

> Life is as tedious as a twice told tale
> Vexing the dull ear of a drowsy man.
> (Shakespeare, *King John*)

The time is always ripe for the words of the Preacher. In our everyday life timing is of the essence and this is never more true than in surgery where the timing of surgical procedures, singly or in sequence, may make the difference between success and complete failure. Perhaps some of you have already realized this to your sorrow.

During World War II, Dr. Edward D. Churchill, then colonel and surgical consultant in the Mediterranean Theater, continually taught and wrote extensively about the proper timing of surgery. This principle of the proper timing of initial, reparative, and reconstructive surgery in the treatment of battle wounds paid big dividends in the early return to duty of many who would otherwise have been evacuated to the zone of communications, or even to the zone of the interior.

Again, in order to produce the best effect, the principle of timing should be considered in the use of many expressions that are in common parlance today. Such terms as "'limited war,' 'unlimited war,' 'conventional armaments,' 'graduated deterrence,' and 'massive retaliation' can be employed profitably in talking about certain hypothetical aspects of war,"[1] but are of optimum value *when* their employment is properly timed.

Frank B. Berry

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UNITED STATES ARMED FORCES MEDICAL JOURNAL

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EFFECTS OF IONIZING RADIATION ON HUMAN PSYCHOMOTOR SKILLS

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THE realization of nuclear propulsion for manned aircraft depends in part on the availability of knowledge about the effects of low-level ionizing radiation upon the psychologic capabilities of those who will fly and maintain them. For obvious reasons the satisfaction of this requirement can at best be little more than approximated through lower animal research. On the other hand, ethical and moral considerations inherent in our culture preclude the development of such knowledge as a primary objective of human experimentation. Thus, the problem of how to obtain relevant and reliable information has been most vexing.

A partial solution to this problem was offered six years ago by the director and staff of the M. D. Anderson Hospital and Tumor Clinic of Houston, Texas.[1] This group had long been interested in the comparative value of radiotherapy and chemotherapy for generalized neoplastic disease, and it foresaw no valid criticism of an incidental and collateral study of behavioral changes, if any, that might arise subsequent to the routine application of radiotherapy. All parties realized, of course, that the scientific orderliness of such a study and the applicability of its results might be somewhat diluted by the necessity for placing responsibility for selection of patients and prescription of doses entirely in medical hands. Nevertheless, the studies which finally resulted from this unique arrangement

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proved reasonably sound. They are reported here because of their useful implications for the Air Force and because they constitute the only known body of human data on this subject. The clinical aspects of the radiotherapy studies were published previously.[1,2]

Two sets of observations will be reported. The first set is concerned with the question whether a given air dose will have a greater effect when delivered in a single exposure than when delivered in a series of fractional exposures, while the second can be considered analogous to a straightforward dose-response study involving relatively high exposure levels. If the results seem trivial now, one should recall that no hindsight was possible six years ago when the studies were begun.

FIRST STUDY

The first study was organized around the therapeutic circumstance that some patients were treated with whole-body doses delivered in single exposures, while others were given equivalent total exposures in five equal increments separated by intervals of 1 hour. Psychomotor performance data obtained from both types of patients made it possible to test a hypothesis about the way in which exposure effects become modified by temporal dispersion.

Subjects were male adults, usually in advanced stages of neoplastic disease that was not amenable to surgical intervention or localized radiation therapy. Their ages ranged from 19 to 76 years.

Three well-known perceptual-motor tasks served as criteria of treatment effects. The U. S. Air Force School of Aviation Medicine (USAF SAM) complex coordination test (fig. 1) required the subject to coordinate the movements of a stick and rudder bar in order to match successive positions of three red lights with three green lights. The USAF SAM two-hand coordination test (fig. 2) required the subject to turn two lathe-like crank handles in order to keep a cursor positioned on an eccentrically moving target. The USAF SAM rotary pursuit test (fig. 3) required the subject to follow a rotating target with a stylus.

Three exposure levels were available for study: 15, 25, and 50 r, as measured in air at the position of a plane which bisected the patient. Each level was reached either by a single exposure or by five equal fractional exposures separated by an interval of 1 hour. Delivery was accomplished by a 400 kvp General Electric x-ray machine with Thoraeus III filtration having a half-value layer equivalent to 4.1 mm of copper. At the target distance of 300 cm, the output was approximately 0.95 r/min. One large field was used, the patient being treated in a lateral position with

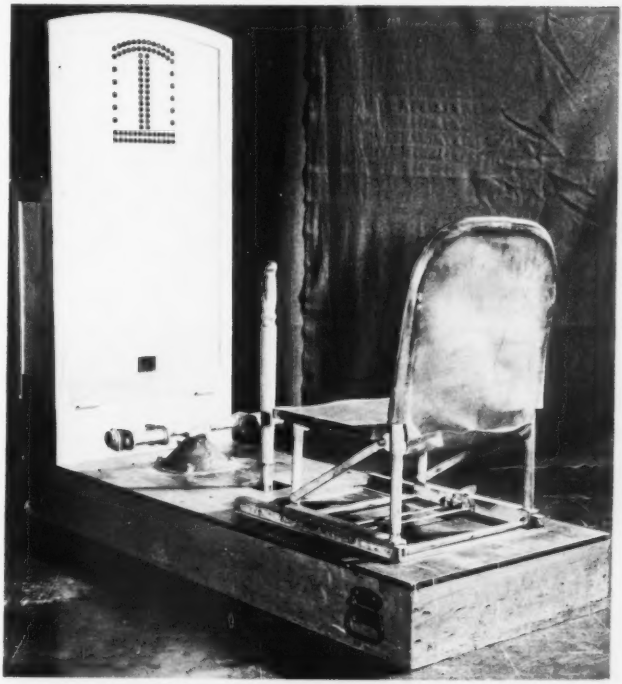

Figure 1. Device used in the USAF SAM complex coordination test.

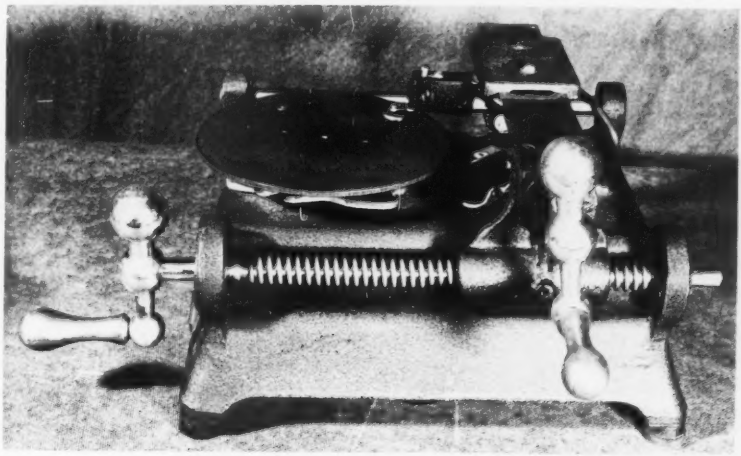

Figure 2. Device used in the USAF SAM two-hand coordination test.

left and right sides alternated in proximity to the target. Air-wall ionization chambers (Farmer) were placed on the patient's skin during exposure in order to measure entrance and exit doses.[3]

Procedure. At about 0800 hours on the day of exposure, each subject was given formal test instructions and a standardized amount of preliminary practice on the three testing devices. Practice sessions were 2 minutes for the complex coordination and two-hand coordination tests, and 100 seconds (five 20-second trials separated by 10-second rests) for the rotary pursuit test. Following practice, the prescribed treatments were begun. One

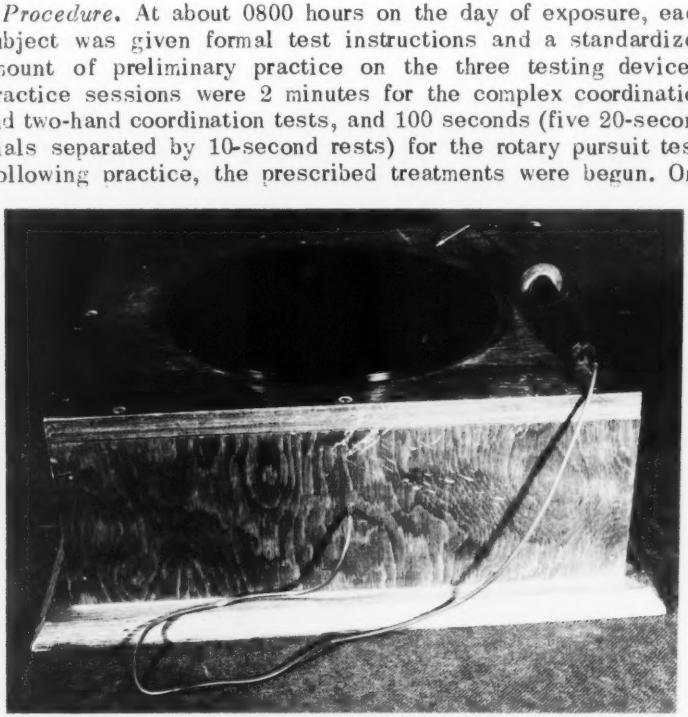

Figure 3. Device used in the USAF SAM rotary pursuit test.

hour later the psychomotor testing sessions were resumed, and they were repeated thereafter at 2-hour intervals until six post-treatment sessions had been completed. Two testing sessions 8 hours apart were completed on the day following treatment. Additional testing was done on some of the subjects, but these data are not considered in the present study. Single-exposure subjects and multiple-exposure subjects within a given total exposure group were treated alike except that the latter alternated between testing sessions and fractional treatment sessions until the five exposures had been accomplished.

Results. Indexes of two somewhat related dimensions of performance were subjected to statistical analysis. The first index was simply the total score achieved during the posttreatment testing sessions or during any portion thereof that seemed worthy

of closer scrutiny. The second index consisted of the tangent of the angle defined by the abscissa of the performance curve and the linear regression of scores upon abscissa values (trials). This was a measure of the linear component of learning rate. Whenever appropriate, each index was adjusted for multiple regression upon chronologic age and pretreatment performance levels before the final analysis of the posttreatment variation was performed. This had the general effect of (1) reducing the contribution of these factors, and of factors correlated with them (such as type and severity of disease), to posttreatment variation, and (2) increasing the precision with which final tests of significance could be made. What remained for the final analysis was the variation attributable to the main experimental effects, their interaction, and the residual differences between subjects.

TABLE 1. *Analyses of adjusted variance of over-all achievement levels*

Source	df	Complex coordination		Two-hand coordination		Rotary pursuit	
		σ^2	F	σ^2	F	σ^2	F
Doses	2	.827	<1.00	5,491	<1.00	256.38	<1.00
Methods	1	.477	<1.00	124	<1.00	1.85	<1.00
D × M	2	.737	<1.00	13,087	1.07	148.68	<1.00
Error	70*	2.538		12,234		1,285.82	
Total	75*						

*Reduced by 2 df for regression of posttreatment scores (y) upon pretreatment scores (x) and chronologic age (z). Regression and correlation values are:

For complex coordination, $b_1 = 1.4928$, and $b_2 = -.0271$. $R_{y.zx} = .78$; $r_{zx} = -.34$ $r_{zy} = -.39$; $r_{xy} = .76$. For two-hand coordination: $b_1 = 1.031$, and $b_2 = -3.7732$. $R_{y.zx} = .83$; $r_{zx} = -.33$; $r_{zy} = -.50$; $r_{xy} = .79$. For rotary pursuit: $b_1 = 1.1944$, and $b_2 = -1.6493$. $R_{y.xz} = .74$; $r_{zx} = -.16$; $r_{zy} = -.47$; $r_{xy} = .74$.

The analysis of complex coordination test results given in table 1 shows clearly that treatment levels and treatment methods do not contribute significantly, either singly or jointly, to the total adjusted variation. The negligible main effects and their uncorrelated status are easily appreciated in figure 4, which shows the adjusted mean scores for each combination of treatment level and treatment method. Comparable analyses were made for each posttreatment trial separately, and for the linear component of the regression of scores upon the eight-trial sequence, but without significant results.

The results of the two-hand coordination test resemble closely those of the previous test. As shown in figure 5, neither the

level of exposure nor the methods of delivery had a discernible effect upon performance, whether viewed in terms of achievement level or (not shown here) in terms of rate of progress.

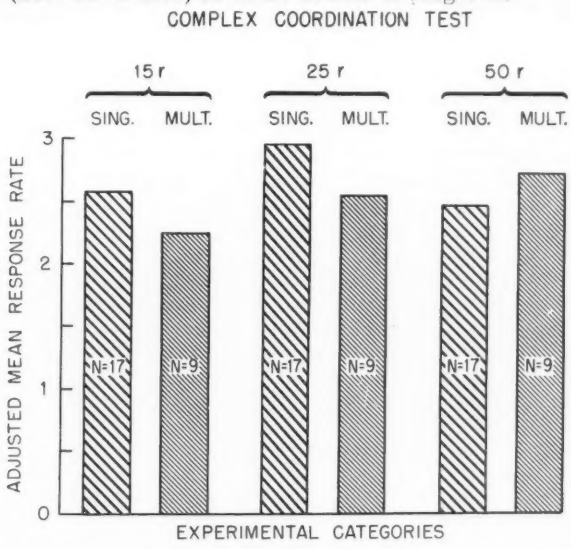

Figure 4. Adjusted subclass mean response rates for complex coordination.

The results of the rotary pursuit test are much like the previous ones with respect to the over-all performance level (fig. 6). However, there is a bare suggestion in the analysis of the linear regression component of the trial means, shown in table 2, that the effects of exposure level and method of delivery may be correlated; that is, the effects of treatment methods may not be the same for all exposure levels. The plot of subclass means in figure 7 suggests that single exposures to a given dose level attenuate the rate of the subjects' progress somewhat more than fractional exposures to the same level, particularly at the higher exposure levels. Although this is consistent with fact and theory concerning interexposure repair of tissue damage, one must recall from the analysis in table 2 that there is no satisfactory degree of assurance that this finding is real. It is mentioned here because of its speculative merit and because it is a rare oasis in a veritable desert of negative results.

Discussion. With the exception of one faint suggestion, which is probably not real, the data considered thus far do not contain the slightest hint that psychomotor performance was affected by the independent variables under investigation. It is possible, of course, that protracted observation might have revealed im-

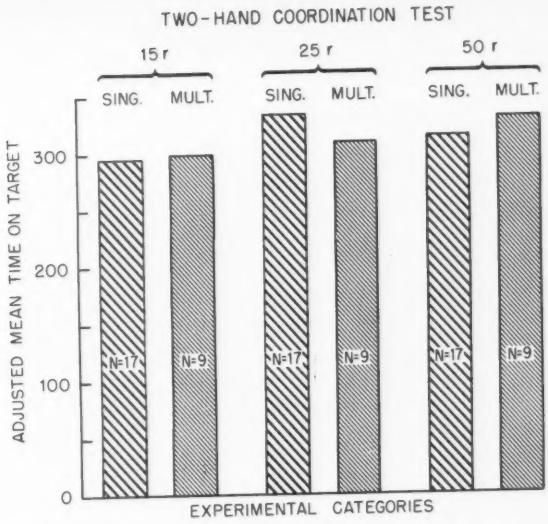

Figure 5. Adjusted subclass mean time-on scores for two-hand coordination.

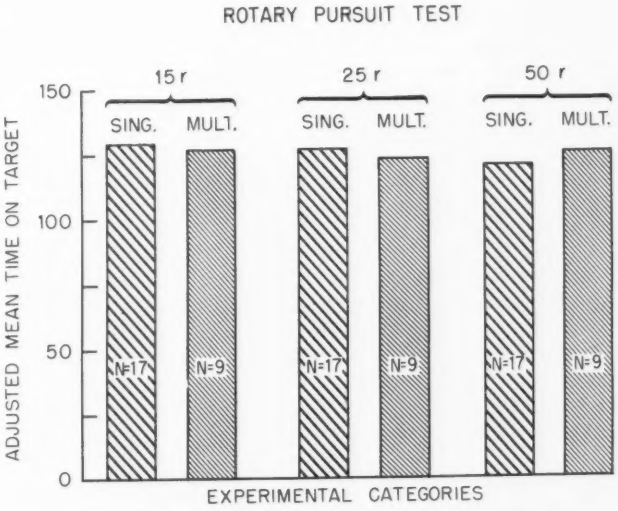

Figure 6. Adjusted subclass mean time-on scores for rotary pursuit.

portant differences, particularly in subsequent rates of progress, but this possibility is generally denied in the study to follow. When viewed in terms of the crew in the nuclear-powered vehicle,

these results do not necessarily provide complete grounds for complacency, for it must be recalled that our subjects, although human, were seriously diseased at the time of study. And it must also be recalled that psychomotor coordination is only one of many processes which underlie aircrew job proficiency.

SECOND STUDY

During the course of the medical staffs' evaluation of the therapeutic value of whole-body x-irradiation, it was deemed clinically sound to prescribe single doses higher than those which prevailed during the period of the first study. As a consequence, psychomotor studies were performed after the administration of single doses as high as 200 r, and for a longer period of time.

TABLE 2. *Analysis of variance of the linear component of scores by trials for rotary pursuit*

Source	df	Mean square	F	P
Doses	2	6.1888	<1.00	
Methods	1	20.9941	2.05	.165
D × M	2	28.6785	2.79	.075
Error	70*	10.2589		
Total	75*			

*Reduced by 2 df for regression of posttreatment scores (y) upon pretreatment scores (x) and chronological age(z).

$R_{y.xz} = .43$; $r_{zx} = -.16$; $r_{zy} = -.42$; $r_{xy} = .11$; $b_1 = .0043$; $b_2 = -.0900$.

As before, subjects were adult males whose participation in the study was governed by the medical staff as previously described. Ages ranged from 23 to 76 years. The psychomotor tasks were the same as those described in the previous study.

As before, patients were exposed in a lateral position with left and right sides alternated in proximity to the target. For approximately half the subjects, mostly those receiving below 75 r, the treatment was delivered as previously described. For the remainder, treatment was accomplished by a General Electric Maxitron operated at 250 kvp with a Thoraeus III filter providing half-value layer equivalent to about 3 mm of copper. Output was about 3.8 r/min. Nine exposure levels, ranging from 0 through 200 r in 25-r steps, were sampled. Each subject received his prescribed exposure in a single session.

Procedure. Beginning at approximately 0800 hours each day for 4 days prior to exposure, each subject was allowed a practice session on each testing device. Practice sessions both before and after exposure were 4 minutes for complex coordination and

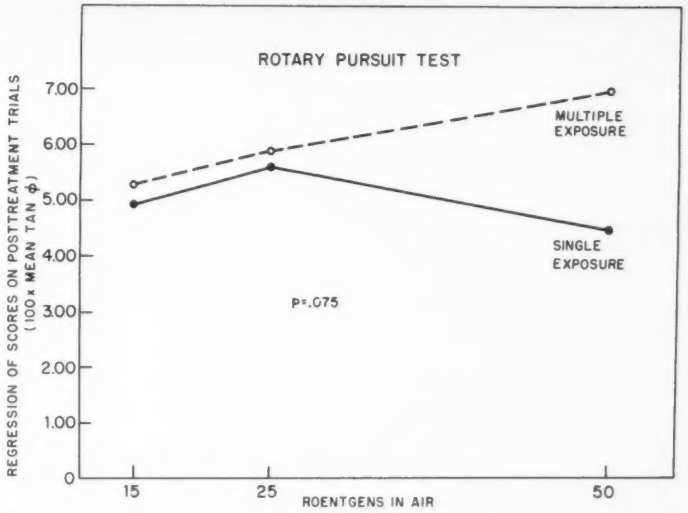

Figure 7. Interaction of exposure level and exposure method for rotary pursuit.

two-hand coordination, and 300 seconds (fifteen 20-seconds trials separated by 10-second rests) for rotary pursuit. Exposure occurred on the morning of the fifth day. One hour later the first posttreatment testing session was held, and this was repeated each day at approximately the same time for 9 days thereafter. All subjects, including controls, were treated essentially alike except for the amount of radiation to which they were exposed.

TABLE 3. *Analysis of variance of adjusted posttreatment achievement levels for rotary pursuit*

Source	df	Mean square	F	P
Groups (doses)	7	23,086	<1.00	ns
Ss treated alike	57	40,466		
Days	9	75,218	68.07	<.001
D × G	63	1,229	1.11	ns
Ss × D	513	1,105		
Trials/day	2	16,353	19.17	<.001
T × G	14	1,039	1.22	ns
Ss × T	114	853		
T × D	18	121	<1.00	
T × D × G	126	272	1.14	ns
Ss × T × D	1,026	238		
Total	1,949*			

*Reduced by 60 df for regression coefficients, as follows: Ss treated alike (-2), Ss x D (-18), Sc x T (-4), and Ss x T x D (-36).

Results. Analyses of variation in posttreatment achievement levels for complex coordination and two-hand coordination were based on the forty 1-minute performance samples obtained from each subject (10 days × 4 min./day), while that for rotary pursuit was based on the thirty 100-second performance samples from each subject (10 days × 300/sec./day). The scores of all subjects in each performance sample were adjusted for their multiple regression on chronologic age and pretreatment levels, and the residual variation of all scores was then analyzed.

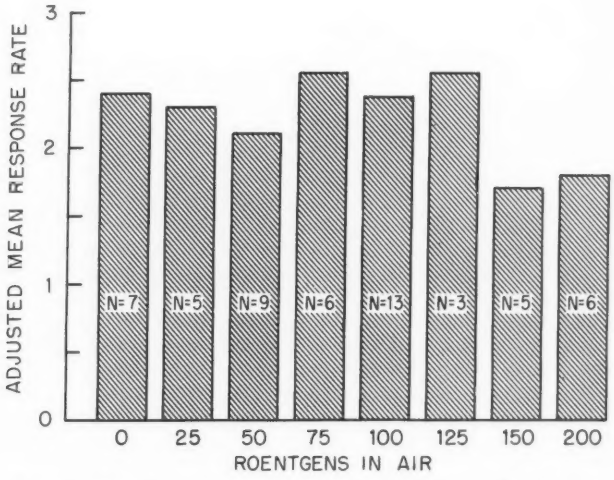

Figure 8. Dose-response function for complex coordination.

The outcomes for all testing devices are fully exemplified by the analysis of adjusted variation for rotary pursuit, as shown in table 3. The highly significant variation attributable to "days" and "trials/day" results from the fact that significant amounts of learning occurred both within each day and from day to day. All radiation groups are essentially alike in this respect, as shown by the interaction values, and there is no evidence of radiation impairment. The radiation group means for the entire posttreatment sequence are shown for complex coordination (fig. 8), two-hand coordination (fig. 9), and for rotary pursuit (fig. 10).

The data from each testing device were further analyzed in terms of the linear component of the regression of scores on posttreatment trials, both within days and from day to day, but none of the analyses implicated radiation exposure as a significant source of variation. Comparable analyses were made in terms of the quadratic component of these regressions; that is,

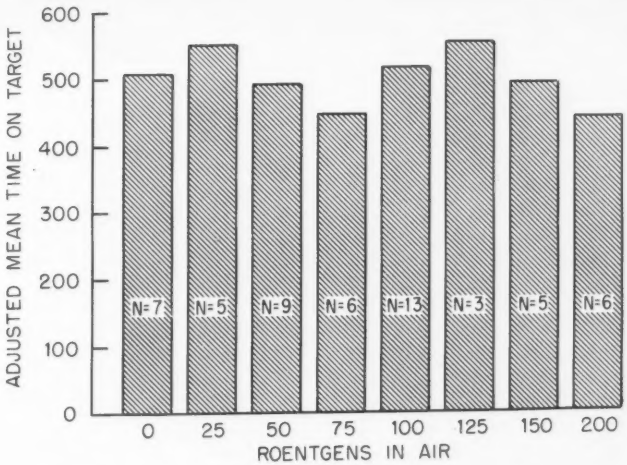

Figure 9. Dose-response function for two-hand coordination.

a regression coefficient was computed for each subject, then the total variation of the coefficients was partitioned with respect to "between groups" and "within groups" sources in order to provide a test of significance of exposure effect. The results of these analyses were negative for two-hand coordination and rotary pursuit, but those for complex coordination were positive, as shown in table 4. A plot of the mean quadratic coefficients against exposure values (fig. 11) suggests, despite the several inversions, that the quadratic component of performance over the 10-day period becomes more negative the more intense the

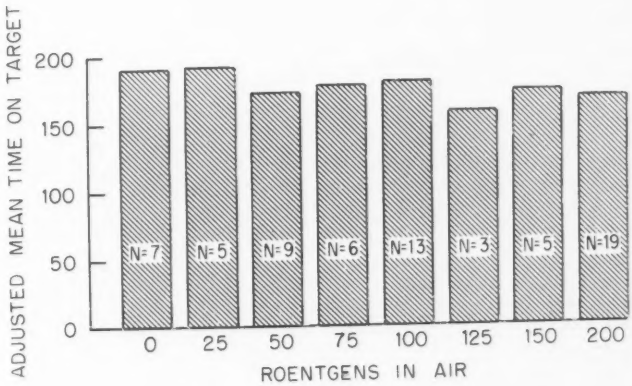

Figure 10. Dose-response function for rotary pursuit.

radiation exposure. Another way of putting this is to say that the more intense the exposure, the more likely it is that performance will be falling, rather than rising, toward the end of the 10-day period of measurement.

TABLE 4. *Analysis of variance of quadratic component of scores by days for complex coordination*

Source	df	Mean square	F	P
Between radiation groups	8	.00282061	3.33	<.01
Within groups	58	.00084699		
Total	66			

Discussion. With the possible exception of the quadratic component of the 10-day performance sequence, there is no evidence that exposure to ionizing radiation has affected the psychomotor skills in question. Whether this exception is a true radiation effect is debatable. It could just as well have been a disease effect, for we must presume that the prescribed exposure intensity bore some relationship to the severity of the disease. This confoundment, of course, was unavoidable. What we may have in this analysis of the curvature aspect of performance sequence is some combination of radiation effect and

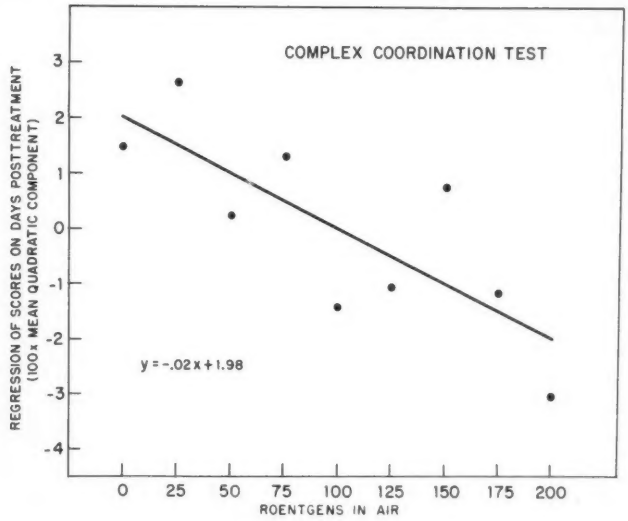

Figure 11. Change in quadratic component of performance sequence as a function of exposure level.

the general debilitating effect of the disease. In any event, the absolute magnitude of change from group to group seems too slight to be of any practical significance.

One further point requires clarification. The radiation variable in these analyses was expressed in terms of air dosimetry because the more urgent objective of the studies was some empiric basis for deciding what behavioral risks might be invited by exposure to various possible radiation fields. However, what the subject was exposed to and what he actually absorbed are not necessarily identical, the latter being a complex function of backscatter, the size and weight of the body, and the absorption coefficient of the various tissues. If one computes an integral body dose more representative of the quantity actually absorbed, it turns out on the average to be a linear function of the air dose. Thus, it is clear that an air dose index would misclassify very few subjects with respect to the quantity absorbed. This would suggest that our results would remain unchanged if analyzed in terms of integral body dose. Checks performed thus far show that this is in fact the case.

Finally, it seems important to re-emphasize that the application of these results to developmental and operational problems should be made with cautious regard for the medical status of the subjects we studied and for the limited relevance of experimental criteria.

ACKNOWLEDGMENT: The writer gratefully acknowledges indebtedness to Doctors R. Lee Clark, Gilbert H. Fletcher, John F. Dillon, Clifton D. Howe, Stella Booth, Lowell S. Miller, Warren K. Sinclair, and Messrs. Joseph E. Rooney and Arthur Cole of the M. D. Anderson Hospital and Tumor Clinic, and to Colonel John E. Pickering, Dr. Herbert B. Gerstner, and Captain Edwin W. Moore of the U. S. Air Force School of Aviation Medicine for their participation in the professional and technical aspects of the studies reported here.

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A good conscience is to the soul what health is to the body; it preserves a constant ease and serenity within us, and more than countervails all the calamities and afflictions that can possibly befall us.—Joseph Addison

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IMPROVED PHONETICS IN ARTIFICIAL DENTURE CONSTRUCTION

LESLIE R. ALLEN, *Lieutenant Colonel, USAF (DC)*

LANDO[1] aptly stated that the three major factors in complete denture construction are mechanics, esthetics, and phonetics. Considerable progress has been made in the last few decades in improving mechanics and esthetics, but little has been done to improve phonetics. Neglect of this major factor in denture construction may be attributed to the fact that most edentulous patients tend to return to normal speech after a post-insertion practice period of several days to several weeks. Various kinds of oral inaccuracies occur during this practice period, but by far the most common, as well as the most difficult to overcome, is the mispronunciation of the *s* and *sh*. While faulty speech is tolerated as part of "getting used to" the artificial denture, it causes embarrassment to the patient and adds to his burden of physiologic adaptation to the denture.

In the Air Force, faulty speech is not to be tolerated when it concerns the flyer or control tower operator, because failure to speak distinctly over the communication system could result in danger for both aircraft and crew. Flyers and control operators are not immune to dental disease, and some of them lose a sufficient number of teeth to warrant replacement. In the prosthetic treatment for this group, phonetics becomes an acute problem. Therefore, the objective of the present investigation was to develop a procedure in artificial denture construction which would enable the patient to speak clearly at the time of insertion of the denture.

The literature in dental prosthetics was reviewed, and previous methods for improving phonetics were evaluated. Snow,[2] after observing many casts of the natural dentition, pointed out that a tracing which started at the vault and passed over the lingual alveolar area to the incisal edge of the maxillary incisor always formed a reverse curve. He recommended thickening and contouring the area lingual to the collars of the maxillary incisors of the artificial denture in order to reproduce this re-

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verse curve, and he maintained that this reproduction facilitated the pronunciation of the *s* and *sh*. Landa used the labiodentals (*f* and *v*) as an adjunct to the arrangement of the maxillary anteriors. He believed the teeth should be arranged so that these fricatives can be pronounced easily and naturally. Landa also maintained that proper vertical dimension is the key to proper pronunciation of the *s* and *sh*. Sears[3] reported that clearer *s* pronunciation will result from fashioning the area of the anterior median ridge according to the type of tongue. He recommended making a groove in this area for the broad tongue with a slight median sulcus, and the building of a ridge in this area for the tongue with a deep median sulcus. Sears also advocated taking a palatogram in cases in which the median sulcus of the tongue does not coincide with the midline. Pound[4] believed that the entire lingual aspect of the maxillary denture should be contoured to simulate the normal, if proper phonetics is to be attained. Many authors recommend the reproduction of the rugae as an adjunct to proper phonetics. Probably the oldest and most widely used procedure for improving speech is the thinning of the entire lingual surface of the maxillary denture in order to create more room for the tongue.

The literature in phonetics was perused, with special attention given to tongue positions in phonation. A moment's reflection of elementary physics recalls that all that is required to produce sound is a source of energy and a vibrator. The source of energy for the voice is expired air from the lungs, and the vibrator is the margins of the vocal folds in the larynx. As air passes the highly sensitive vocal folds, appropriate portions of the margins vibrate to produce the desired sound. This sound is modulated by the larynx, the laryngeal pharynx and the nasopharynx, the nose, and the oral cavity, all of which act as cavity resonators to give resonance to the voice. Further modulation is brought about by the articulation which takes place between the vocal folds, the velum and the pharynx, the tongue and the velum, the tongue and the hard palate, the tongue and the teeth, the lips and teeth, and finally the lips themselves.

The tongue plays a major role in speech. It changes position and shape for the pronunciation of each of the vowels, and it is the principal articulator for the consonants. In pronouncing the consonants, the tongue contacts various portions of the teeth, the alveolar ridge, and the hard palate. Inasmuch as these structures are either replaced or covered by the artificial denture, it was basic to the study to know exactly which portions of these structures are normally contacted by the tongue in pronouncing a given consonant. To accomplish this, palatograms were made on a group of dentulous persons with normal speech, who were chosen so as to incorporate a maximum variety of tooth arrangement, tooth occlusion, arch form, arch size, vault form, and vault depth.

PROCEDURE

Palatograms for the Dentulous Group

A uniformly thin artificial palate was constructed of methyl methacrylate for each subject. The palate was inserted and tested for retention and adaptation. The subject practiced speaking with the palate in place until speech became clear. Trial tests for the palatogram were made by having the subject pronounce a given sound and open his mouth without again contacting the palate with his tongue. The palate was then removed, thoroughly dried, dusted with nonscented talcum powder, and carefully inserted in the mouth. The subject was then asked to pronounce the previously practiced sound, and the palate was carefully removed and examined. The moist tongue removed the powder from the area of contact, leaving a clear tracing (palatogram) on the artificial palate (fig. 1). However, after a short period. this area dried and the tracing became obscure. In order to preserve the palatogram for future study, the contact area was outlined with a glass-marking pencil immediately after the palate was removed from the mouth.

Palatograms were made for all the vowels, and in studying and comparing these, it was found that the tongue contacts portions of the palate in pronouncing all the vowels except *o*. Therefore, in making palatograms of the consonants, the *o* was used in combination with the consonant to be studied even though the combination did not result in a standard word. Consonants alone could not be used, because the pronunciation of any of the consonants involves two or more sounds, and therefore, two or more tongue positions; for example, to pronounce *s*, the *e* sound is made, followed by the characterictic "s-s-s" of the *s*. One has only to pronounce the *s* slowly to prove this to be true. The same *e* sound precedes the *f*, *l*, *m*, and *n*. In pronouncing *t*, the "tuh" is made first, followed by the *e*. The same *e* follows *b*, *c*, *d*, *g*, *p*, *v*, and *z*. In order to avoid primary or secondary contact, the *o* was used in combination with whatever consonant was studied.

Palatograms of all the consonants were made and filed for study. In studying and comparing the palatograms of the same consonant pronounced by different members of the group, it was found that no two persons contacted exactly the same area in pronouncing the consonant, but that a sufficient similarity existed to constitute a pattern (fig. 2). The patterns for the *t*, *d*, *n*, and *l* were not distinct individually (that is, it was not possible to look at a palatogram and determine which of these consonants had been pronounced in making the tracing); however, the group pattern for these consonants was sufficiently distinct to be certain that either the *t*, *d*, *n*, or *l*, had been pronounced in making the tracing. A comparative analysis of the palatograms

of the *s* and *sh* was of particular interest, because each of these presented an individual similarity and constituted a distinct pattern (figs. 3 and 4).

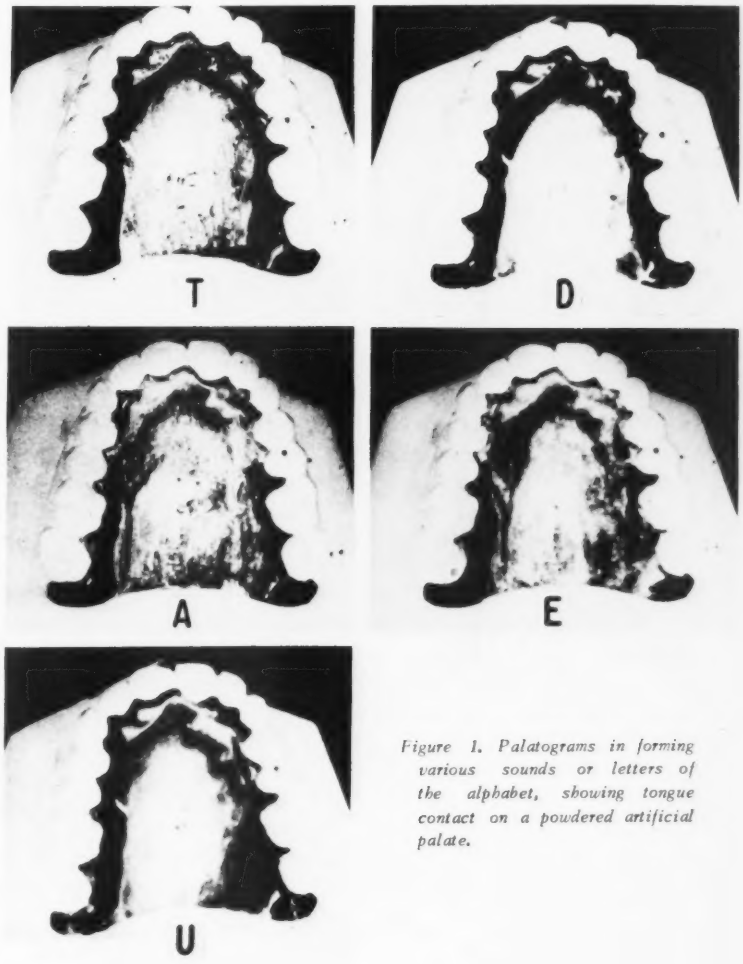

Figure 1. Palatograms in forming various sounds or letters of the alphabet, showing tongue contact on a powdered artificial palate.

Over 500 palatograms were made, and by the palatographic study we were able to obtain a definite picture of tongue palatal contact for the pronunciation of the vowel or consonant. In order to test the areas most sensitive to thickness, various portions of the artificial palate were thickened in increments of 1 mm of wax. The addition of 1 mm in the anterior region

(from cuspid to cuspid) made speech awkward, difficult, and indistinct. The addition of 1 mm thickness in the posterior alveolar area made speech awkward but not indistinct. The entire vault area could be filled with wax up to the outline of tongue contact without interfering with speech (fig. 5).

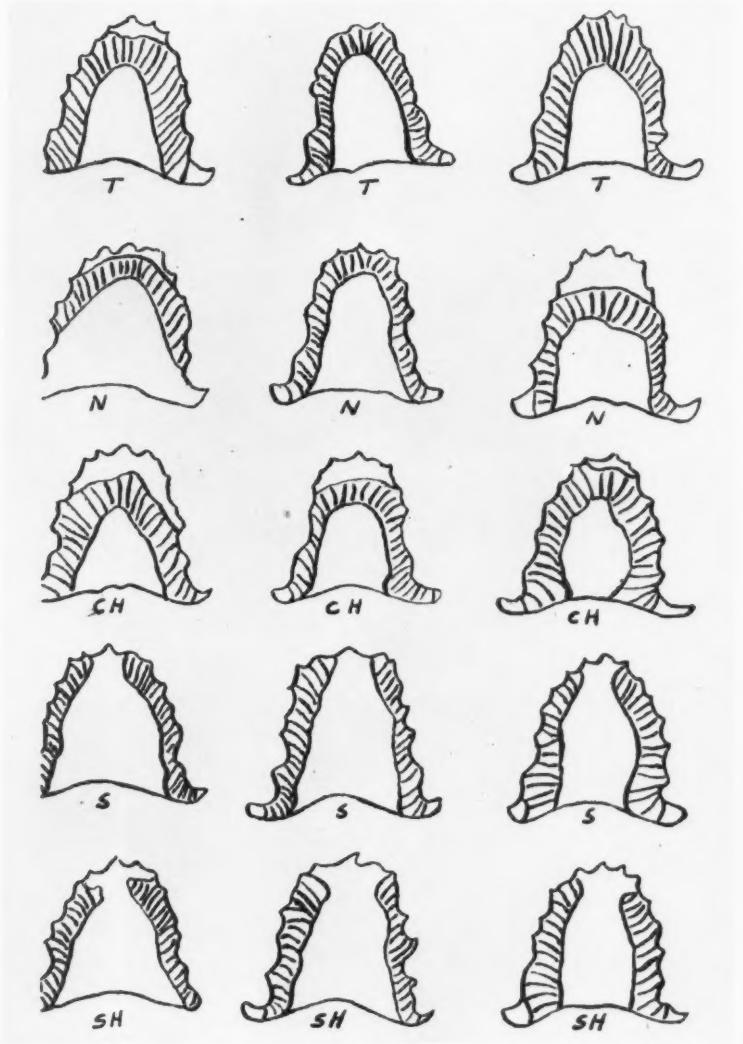

Figure 2. Palatograms of various people, sufficiently similar to constitute a pattern.

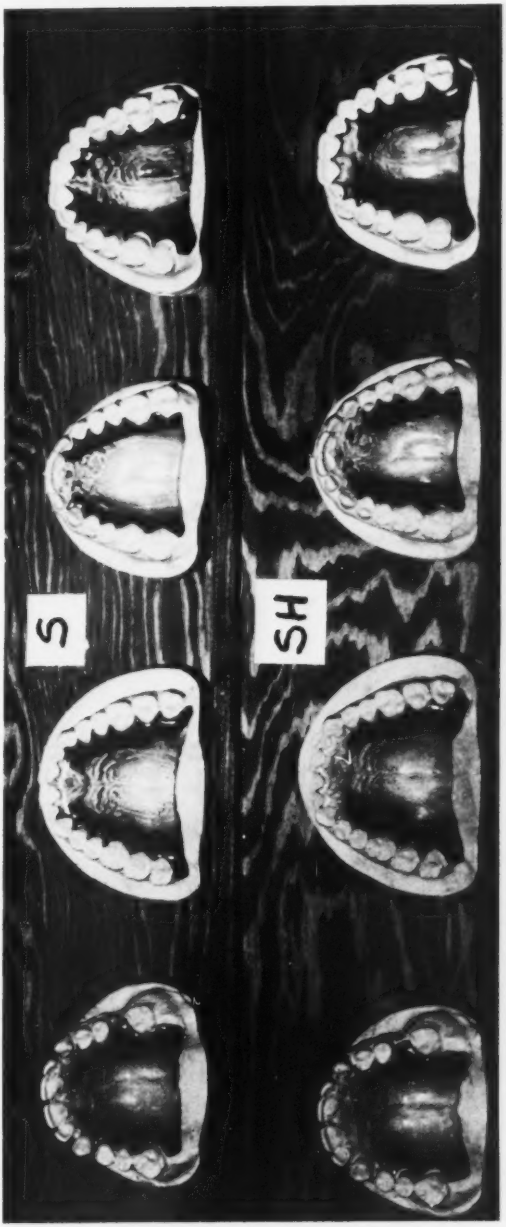

Figure 3. Patterns in palatograms in pronouncing s *and* sh.

Figure 4. Patterns in palatograms in pronouncing s *and* sh.

The next phase of the investigation consisted of incorporating this information into a procedure for artificial denture construction.

Palatograms for the Edentulous Group

In the first part of this phase of the investigation, no effort was made to be selective in choosing subjects for the study. The criterion was that the subject be edentulous and physio-

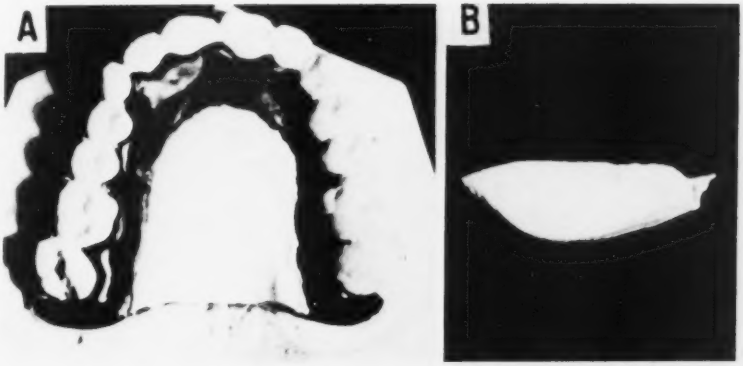

Figure 5. (A) Vault area waxed. (B) Cross section of wax.

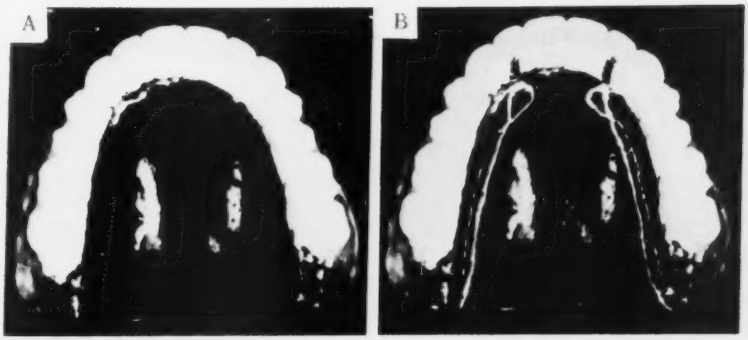

Figure 6. (A) Waxed surface between baseplate and collars of teeth. (B) Area of tongue contact outlined with glass-marking pencil.

logically ready for prosthetic treatment. The application of the palatographic study was started while the dentures were in the waxed, "try-in" stage, and after satisfactory esthetics, correct centric, proper vertical dimension, and balanced occlusion had been attained. The mandibular trial base was waxed to completion in the usual manner, and the final waxing was done on the labial and buccal aspects of the maxillary trial base. The waxing on the lingual surface of the maxillary trial base was

confined to the area immediately adjacent to the teeth, with a minimum of wax added to assure a smooth surface between baseplate and collars of the teeth (fig. 6A). The mandibular trial base was then placed in the subject's mouth, after adhesive powder had been sprinkled on the tissue surface to ensure maximum retention and stability. Nonscented talcum powder was dusted on the lingual surface of the maxillary trial base, and the base was carefully seated in the subject's mouth. The subject was then instructed to pronounce the consonant to be studied. The trial base was carefully removed from the patient's mouth, and the area of tongue contact was outlined with a glass-marking pencil (fig. 6B). The outlined area was waxed, contoured, redusted, and another palatogram made. This procedure was repeated until a normal tongue palatal contact was established.

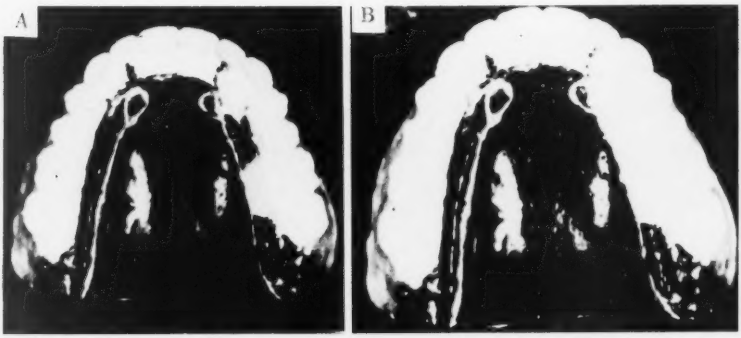

Figure 7. (A) Waxed area between collar of tooth and pencil line. (B) Waxed area between collar of tooth and anterior palatal line.

To develop a normal pattern, it was always necessary to thicken the outlined area. Sufficient thickness was usually obtained by the following procedures: Waxing was started around the first molar; enough wax was added to create a 1-mm margin around the collar of this tooth. The area between this margin and the pencil line on the palate was then filled with wax and smoothed (fig. 7A). Next, enough was added around the delineated anterior teeth (those included in the tracing) to allow a ½-mm margin at the collars. The area between this margin and the anterior palatal line was waxed and smoothed (fig. 7B). Waxing of the bicuspid area was accomplished by adding wax between the palate line and the collars of the bicuspid teeth in sufficient quantity to present an even contour between the anterior and molar waxed areas. Waxing was completed by adding sufficient wax between the palatal line and second molar to present an even contour between the waxed first molar and posterior border of the baseplate.

In some cases, contouring the tongue palatal contact area to simulate the normal was all that was required for the proper

pronunciation of the *s* and *sh*; however, most cases required the addition of a small amount of wax in the area of the incisive papilla to prevent the jet of air emitted through the median sulcus of the tongue from escaping towards the vault (fig. 8A). The completed lingual wax-up is shown in figure 8B.

The final phase of the investigation consisted of studying tongue palatal contact of denture wearers who had faulty speech. The speech inaccuracy in all these cases was mispronunciation of the *s* and *sh*. The mispronunciations fell into two categories: In the one there was a continuous *s*, so that the speech resulted

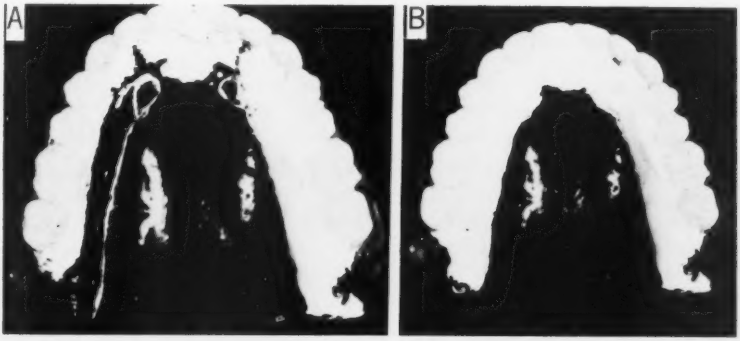

Figure 8. (A) Waxed area of the incisive papilla. (B) Complete lingual waxed area.

in a whistling when the *s* was pronounced; in the other, there was an indistinct *s*, which resulted in the *sh* sound when the *s* was pronounced. Palatograms were made on this group in the usual fashion. It was found that in all cases there was an abnormal tongue palatal contact.

FINDINGS

A thin, well-adapted artificial palate (about 1 mm thick) does not greatly impair normal speech. In making the speech test prior to making the palatograms for the dentulous group, it was found that only a few minutes of practice were required by most of the subjects to enunciate properly. It was also noted that during this short practice period, the *t*, *d*, *n*, and *l* were more awkward to pronounce than the *s* and *sh*.

A study of the palatograms showed that in pronouncing the consonants, the primary area of tongue contact is the alveolar area, and that only a small portion of the hard palate is involved. In a comparative analysis of the *s* and *sh* palatography, it was interesting to note that the rugae area was contacted slightly in some cases and not at all in others, but that in all cases the the entire posterior alveolar area was always contacted. It

was further noted that the rugae area was only slightly involved in the pronunciation of the *t, d, n,* and *l*.

It was found that in order to develop a normal tongue pattern for the *s* and *sh* in the maxillary denture, it was always necessary to thicken the posterior alveolar area.

DISCUSSION

Many clinicians have successfully used the reproduction of the reverse curve, as recommended by Snow, to improve the pronunciation of the *s* and *sh*. Experiments showed that this procedure has merit in that it prevents the jet of air emitted by the median sulcus of the tongue from escaping toward the vault; however, it was found that in some instances, the reproduction interfered with the pronunciation of the *t, d, n,* and *l,* and occasionally interfered with anterior lateral tongue contact in pronouncing the *s*. To avoid these possible interferences, thickening was confined to the area of the incisive papilla.

The use of the labiodentals, as recommended by Landa, is a prudent procedure for arriving at proper arrangement of the anterior teeth, and the proper vertical dimension which he recommends for *s* pronunciation certainly is important; however, all too often, after arriving at proper vertical dimension, faulty pronunciation of this consonant is still evident.

Sears's method of grooving the area of the anterior median raphe for the tongue with a slight median sulcus was found to be helpful in some cases; however, thickening the lateral alveolar area to produce normal tongue contact tends to increase the median sulcus of the tongue and allows a jet of air to be emitted normally. Sears's suggestion of taking a palatogram on cases in which the median sulcus does not coincide with the midline is excellent and is an added reason for the use of the palatography to improve phonetics in complete denture construction. In the palatographic study of the dentulous group, it was found that the median sulcus and the midline did not coincide in 20 per cent of the cases studied. The lack of coincidence is greater in the edentulous cases, because, for esthetic reasons, the maxillary centrals are set according to the facial midline rather than to the palatal midline.

Pound was successful in improving phonetics by contouring the entire lingual aspect of the maxillary denture to simulate the normal; however, most of us do not possess the dexterity to approximate Pound's craftsmanship. In this investigation, it was found that good results could be attained by thickening the necessary areas to produce normal tongue contact without meticulous carving and contouring.

SUMMARY AND CONCLUSIONS

Palatograms were made on a group of dentulous persons who had normal speech and presented a variety of problems as to

tooth arrangement, tooth occlusion, arch form, arch size, vault form and vault height. A comparative analysis of the palatograms indicated that no two persons contacted exactly the same area in pronouncing a given consonant, but that sufficient similarity existed to consitute a pattern. The patterns for the *t, d, n,* and *l* were not distinct; that is, it was not possible to look at a palatogram and determine which of these consonants had been pronounced in making the tracing; however, the pattern for these consonants as a group was distinct, so that it was possible to look at a palatogram and be certain that either *t, d, n,* or *l* had been pronounced.

The patterns for the *s* and *sh* presented an individual similarity and constituted a distinct pattern. The pattern for the *s* begins approximately in the region of the lateral incisors, and bilaterally includes most of the posterior alveolar region. The pattern for the *sh* begins approximately in the cuspid region, and bilaterally includes all of the posterior alveolar area and some of the vault. In a comparative analysis of the *s* and *sh* palatography, it was found that the rugae area was contacted in some cases and not at all in others, but that in all cases, the entire posterior alveolar area was always contacted. It was also found that the rugae area was only slightly involved in the pronunciation of the *t, d, n,* and *l*.

The area most sensitive to thickness is the anterior alveolar area from cuspid to cuspid. An addition of 1-mm thickness in this area made speech awkward and indistinct, and an additional 1-mm thickness in the posterior alveolar area made speech awkward but not indistinct. The entire vault area could be thickened up to the tongue palatal tracing line without interfering with speech.

To develop a normal *s* and *sh* tongue palatal pattern in the waxed maxillary trial base, it is usually necessary to thicken the area outlined by the palatogram. In most cases, it is also necessary to thicken the area of the incisive papilla to prevent the jet of air emitted by the median sulcus of the tongue from escaping toward the vault. It was found that building the tongue palatal contact area to normal and thickening the area of the incisive papilla facilitates proper enunciation and eliminates much of the postinsertion practice period.

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MODIFICATIONS OF REDDY METHOD FOR ESTIMATION OF 17-HYDROXYCORTICOIDS IN BLOOD

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IN 1950, Porter and Silber[1] described a quantitative color reaction for 17,21-dihydroxy-20-ketosteroids. From this development, a wide variety of procedures for the determination of plasma and urinary corticosteroids has evolved. Essentially, all such procedures involve three phases: extraction, purification, and colorimetric evaluation. Borth[2] recently presented a critical review of urinary methods in use at the present time. Methods for the determination of blood corticoids have been reviewed by Gold.[3]

Alterations in plasma steroid levels appear more meaningful than urinary steroid changes in providing a quantitative interpretation of adrenocortical function in man. Blood studies have considered primarily the free (unconjugated) steroids in peripheral blood.

In the search for a more definitive reflection of the rate of adrenocortical secretion, Reddy and associates[4] developed a butanol extraction procedure for the determination of plasma total 17-hydroxycorticoids (17-OHCS.) These workers considered the term "total" justified on the following bases: (1) the earlier use of butanol for the extraction of water-soluble conjugated estrogens and 17-ketosteroids,[5] (2) the spectral curve similarities obtained between known and unknown extracts when using the relatively specific Porter-Silber reaction,[4] and (3) the correlation of steroid secretion and excretion rates with known states of adrenal cortical function.[4,5] The method devised by Reddy and associates included steroid extraction from plasma with butanol (butyl alcohol) and sodium sulfate; purification with sodium carbonate; evaporation of the solvent; and color development with a sulfuric acid-ethyl alcohol-phenylhydrazine reagent.

From Departments of Pathology and Experimental Dentistry, U. S. Air Force School of Aviation Medicine, Randolph Air Force Base, Texas. Report 59-24.

The need for 10 ml of plasma in the Reddy method led other investigators[6] to develop a micromethod for total 17-OHCS. Utilizing 5 ml of plasma per assay, these workers reported values that were not substantially different from those found by the Reddy technic.

When work was undertaken in this laboratory to incorporate the determination of blood 17-OHCS in a current study on physio-

TABLE 1. *Comparison of 17-hydroxycorticoid extraction and purification procedures.*

Sample No.	10-min. extraction with butanol 5-min. purification		10-min. extraction with butanol 10-sec. purification		5-min. extraction with butanol 5-min. purification	
	Mean*	S.D.	Mean*	S.D.	Mean*	S.D.
1	55.6	5.2	20.6	4.3	49.4	5.5
2	46.6	7.7	21.2	5.2	45.5	9.0
3	51.6	8.8	28.9	3.8	54.5	7.7
4	54.2	9.8			45.9	6.3
5	57.5	5.3	31.5	18.9		

*Mean of four determinations, expressed in gamma per 100 ml.

logic changes evidenced by aircrew personnel, several technical difficulties were encountered. This report is concerned with these problems and a determination method based on their solution.

TECHNICAL CONSIDERATIONS

Protein precipitation. Difficulty was encountered in initial attempts to duplicate the micromethod of Brancaccio, D'Alessandro, and De Luca.[6] Values averaging 10 gamma per 100 ml were obtained, in contrast to a mean of 34 gamma per 100 ml reported by the Italian workers. Only after the incorporation of a stepwise, thorough mixing of plasma with the protein precipitating reagents were acceptable values obtained. The technic used is described in detail later in this report.

Steroid extraction. In an attempt to achieve maximal extraction of blood steroids into butanol, a comparison was made between the conventional 5-minute extraction period and a 10-minute period. The longer period produced slightly higher steroid values (table 1) and, for this reason, has been incorporated in the procedure used in this laboratory. Extraction periods longer than 10 minutes produced no increase in steroid values.

Extract purification. To remove nonspecific chromogens, Reddy and associates[4] added anhydrous sodium carbonate to the butanol extract, and the mixture was "thoroughly shaken."

TABLE 2. *Effect of temperature in the evaporation of butanol extracts of 17-hydroxycorticoids*

Temperature (°C)	Time for evaporation (min.)	17-hydroxycorticoids	
		Mean*	S.D.
95-97	8-10	33.5	9.5
85-87	14-16	47.0	6.9
80-82	17-22	46.5	2.9

*Mean of five determinations, expressed in gamma per 100 ml.

Brancaccio, D'Alessandro and De Luca[6] incorporated an apparently arbitrary period of 5 minutes for shaking the extract. To clarify requirements for purification, a comparison was made between the use of a 5-minute mechanical shake of the carbonate-

TABLE 3. *Effect of freezing protein-free plasma filtrates*

Sample No.	17-hydroxycorticoids (gamma per 100 ml)	
	Plasma*	PFF**
1	67.4	75.0
2	63.5	59.0
3	61.2	63.5
4	39.5	27.0
5	37.5	31.2
6	18.8	14.5
7	27.0	31.2
8	86.2	79.5
9	72.8	68.2
Mean	52.7	49.9

*Complete assay carried out on fresh plasma samples.

**Assay was carried out on fresh plasma to step 3 of extraction procedure (protein-free filtrate), then filtrate was frozen and assay completed 72 hours later.

treated butanol extract and a vigorous 10-second digital shake. The 5-minute shaking period proved to be a more effective procedure (table 1). Shaking in excess of 5 minutes did not provide additional purification.

Drying of extract. Brancaccio, D'Alessandro, and De Luca stated that the butanol extract was dried in a "tube" at 80° to 85°C, while Reddy and associates[4] recommended drying in an Erlenmeyer flask suspended in a 90° to 95°C water bath. Efforts with these evaporation technics proved either unsuccessful or excessively time consuming. Dryness could not be achieved without complicated aspiration apparatus to compensate for reflux tendencies. Use was then made of weighing bottles with ground-glass rims, 50 mm high and 40 mm in diameter. By a technic described later in this report, 21 samples can be dried together in 17 to 22 minutes. Subsequent incubation of these samples was carried out in the same bottles, thus affording greater accuracy as well as simplified methodology.

Additional experiments proved that temperatures as low as 60°C produced mean values virtually identical to those for 85° to 87°C and 80° to 82°C (table 2). The 80° to 82°C range was used because of the better duplication of values obtained on replicates dried at that temperature.

TABLE 4. *Comparison of 17-hydroxycorticoid levels in plasma and serum*

Sample No.	17-hydroxycorticoids (gamma per 100 ml)	
	Plasma	Serum
1	52.2	50.0
2	34.0	41.0
3	45.5	47.5
4	50.0	50.0
5	31.8	36.2
6	72.8	72.8
7	54.5	52.2
Mean	48.7	49.9

Sample storage. Because a complete assay run of 16 unknowns, 2 standards, and 2 blanks required about 6 hours, it was desirable to determine if the samples could be processed to the protein-free filtrate (PFF) stage, then frozen, and the determination completed later. Two complete assay runs could then be com-

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pleted from the PFF state in a single working day. Although slightly higher levels were obtained from an uninterrupted plasma assay (table 3), the greater convenience associated with freezing at the PFF state warranted its incorporation in the routine analysis of large numbers of blood samples.

Plasma versus serum. In associated blood electrolyte studies, the use of serum was advantageous. A comparative study of steroid levels in plasma and serum revealed no systematic differences (table 4).

REAGENTS

It is mandatory that the highest grade reagents be used in this procedure. Inferior grade or contaminated lots of butyl alcohol, sulfuric acid, ethyl alcohol, or phenylhydrazine produce excessively high blanks and erratic standard curves. The reagents listed in this report have proved satisfactory when purified and used as indicated.

1. Zinc sulfate, 10 per cent. Dissolve 100 grams of $ZnSO_4 \cdot 7H_2O$ (reagent grade) in distilled water and dilute with water to 1,000 ml in a volumetric flask.

2. Sodium hydroxide, 0.5 normal. Dissolve 20 grams of NaOH (U.S.P. pellets) in distilled water and dilute with water to 1,000 ml in a volumetric flask.

3. Sulfuric acid, 50 per cent. Add 100 ml of concentrated H_2SO_4 (Fisher reagent grade) to 100 ml of distilled water.

4. Sodium sulfate, anhydrous, granular (reagent grade).

5. n-Butyl alcohol (Mallinckrodt analytical reagent grade). This reagent is purified according to a procedure described by Reddy.[7]

6. Sodium carbonate, anhydrous (reagent grade).

7. Ethyl alcohol (absolute pure EtOH, U. S. Industrial Chemicals Co.). Redistill before use.

8. Sulfuric acid, 62 per cent. Add 620 ml of concentrated H_2SO_4 (Fisher reagent grade) to 380 ml of distilled water.

9. Phenylhydrazine hydrochloride (Baker's purified). This reagent is purified according to the procedure described by Peterson, Karrer, and Guerra.[8]

10. Phenylhydrazine reagent. To 5 ml of 62 per cent sulfuric acid is added 87.5 mg of phenylhydrazine hydrochloride. This reagent is prepared fresh before each use.

11. Blank reagent. Four parts of 62 per cent sulfuric acid are added to one part of ethyl alcohol.

12. Hydrocortisone standard. Ten mg of hydrocortisone is dissolved in 100 ml of n-butyl alcohol. This stock solution remains stable for

at least 6 months in the refrigerator. A dilute working standard is prepared by diluting 2 ml of the stock solution to 100 ml with n-butyl alcohol (2 gamma per ml).

PROCEDURE

Extraction. The extraction procedure is carried out as follows:

1. To 5 ml of plasma or serum in a 15-ml, ground glass-stoppered centrifuge tube, 1 ml of 10 per cent $ZnSO_4$ is added. The mixture is shaken vigorously for 30 seconds, and an additional 1.5 ml of $ZnSO_4$ solution is added. The mixture is again shaken vigorously for 30 seconds. An identical additive procedure is carried out with 2.5 ml of 0.5 normal NaOH.

2. After centrifugation for 30 minutes at 2,500 r.p.m., the supernate is decanted into another tube and recentrifuged for 10 minutes at 2,500 r.p.m. (Second centrifugation is essential to provide adequate supernate.)

3. The supernate is decanted into a 25-ml, ground glass-stoppered tube containing 3 drops of 50 per cent H_2SO_4. (If it is necessary to interrupt the procedure, the sample may be frozen at this point.) Two grams of sodium sulfate are added, and the tube is shaken vigorously until the Na_2SO_4 has dissolved.

4. Five milliliters of n-butyl alcohol are then added, and the mixture is agitated at maximal speed on a mechanical shaker (Model CC, wrist-action shaker, Burrell Corporation, Pittsburgh, Pa.) for 10 minutes.

5. After centrifugation for 10 minutes at 2,500 r.p.m., as much of the butanol supernate as possible is transferred to a 15-ml, ground glass-stoppered centrifuge tube. (Delicate control of aspiration is effected by the use of a fixed 20-ml syringe attached by rubber tubing to a 5-ml pipet.)

Purification. The purification procedure is as follows:

1. To the butanol extract is added 0.15 gram of sodium carbonate, and the tube is agitated at high speed on the mechanical shaker for 5 minutes.

2. The mixture is allowed to stand for 5 minutes and is then centrifuged for 5 minutes at 2,500 r.p.m. A 4-ml portion of the extract is transferred into a weighing bottle.

3. The contents of 21 of these bottles are then dried simultaneously in the following manner:

Utilizing an electric hot plate, water in a round, stainless-steel pan (12½ inches upper inside diameter, 9 inches lower inside diameter, 5 inches depth) is maintained at 80° to 82°C. A sheet metal cover of two circular layers, held 1⅛ inches apart by metal screws, is placed on the pan. The upper layer, the rim of which fits flush against the flange of the pan, is 14⅝ inches in diameter and contains 22 holes,

each $1\frac{7}{8}$ inches in diameter. The lower circular layer, 12 inches in diameter, contains twenty-two 1-inch diameter holes situated directly under the larger holes of the upper layer. A seal to the pan is afforded by rubber tubing fitted around the rim of the lower layer. Weighing bottles, placed in each of 21 upper holes, completely cover the lower holes. A thermometer is placed in the other opening. Water level is maintained just below the base of the weighing bottles.

Figure 1. Equipment used in evaporation of butanol.

The entire setup is placed in a closed hood, with the hood fan operating throughout the drying period. A small household fan, located in a corner of the hood, is turned on after the bottles have been on the water bath for a 4-minute period. Air from the fan is directed over different groups of bottles by rotating the pan a quarter-turn each 4 minutes. This equipment is illustrated in figure 1.

Colorimetry. This is determined by the following procedure:

1. When evaporation is complete, 2.5 ml of the blank reagent is added directly to each weighing bottle, and ground-glass stoppers are inserted. The contents are mixed thoroughly by digital rotation of the bottles.

2. The bottles are placed in a water bath at 60°C for 20 minutes, then cooled in running tap water for 5 minutes.

3. The content of each bottle is pipetted into a 10-mm Corex cuvette and read in a Beckman DU spectrophotometer at a wave length of 410 millimicrons, against a water blank.

4. Then 0.1 ml of phenylhydrazine reagent is added to each bottle, the cuvette content returned thereto, and the bottles reincubated at 60°C for 20 minutes. They are again cooled, the contents poured into the same cuvettes as before, and a second reading made at 410 millimicrons, against a water blank. With meticulous care, the required transfer of samples between bottles and cuvettes can be carried out without loss of fluid.

5. In each routine analysis of 16 plasma samples, two 5-ml aliquots of distilled water are carried through the entire procedure to serve as reagent blanks, and two 5-ml samples of butanol containing 2 gamma and 4 gamma of hydrocortisone, respectively, serve as standards. (Because a 4-ml aliquot is taken in step 2 of the purification procedure, the final standard solutions contain 1.6 gamma and 3.2 gamma of hydrocortisone, respectively.)

Calculations:

A = reading after phenylhydrazine addition.

B = reading before phenylhydrazine addition.

a = A − B (sample).

b = A − B (standard).

c = A − B (reagent blank).

a − c = corrected optical density (C.O.D.) of the unknown sample.

b − c = C.O.D. of standard (then equated to 1 gamma).

$$\text{Gamma of hormone present in 100 ml of plasma} = \frac{\text{C.O.D. sample}}{\text{C.O.D. standard}} \times 25.$$

Sample Calculation:

Sample	*Standard (1.6 gamma)*	*Reagent blank*
A .191	A .049	A .030
B .150	B .017	B .014
a .041	b .032	c .016

a − c = .041 − .016 = .025 C.O.D. sample

b − c = .032 − .016 = .016

.016 ÷ 1.6 = .010 C.O.D. standard

$$\frac{.025}{.010} \times 25 = 62.5 \text{ gamma per 100 ml.}$$

RESULTS AND DISCUSSION

Figure 2 illustrates a representative standard curve obtained with hydrocortisone as reference standard. The results conformed to the Beer-Lambert law. The precision of the method based on the average difference between 95 sets of duplicates indicated a standard deviation of 5.48 and a coefficient of variation of 10.38 per cent.

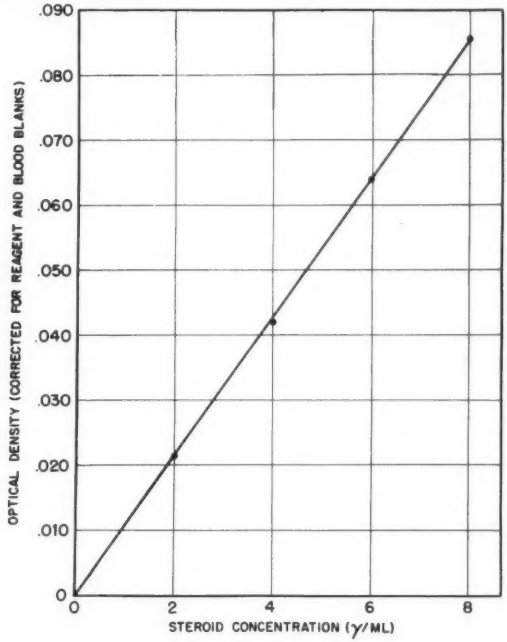

Figure 2. A typical standard curve showing the relation between intensity of color and quantity of 17-hydroxycorticoids.

Recovery studies were carried out by adding known amounts of hydrocortisone in water either to plasma PFF or to untreated plasma samples. Table 5 shows that, although essentially quantitative recoveries (mean, 98 per cent) were obtained by adding standard hydrocortisone at the PFF stage, relatively poor recoveries (mean, 65 per cent) resulted from addition of hydrocortisone to plasma. When known amounts of hydrocortisone dissolved in butanol were added to the protein-free filtrate in step 4 of the extraction procedure, essentially the same recoveries were obtained as found when the water solution of hydrocortisone was added to the PFF. The Italian workers[6] reported recoveries of 95 to 101 per cent when cortisone in butanol was

added during either the extraction or the drying phase. Reddy and associates[4] reported recoveries ranging from 94 to 120 per cent when aqueous cortisone was added to plasma before preparing a protein-free filtrate. In neither case was it readily apparent at exactly which step in the procedure the standard solution was added. The reason for the low recoveries on adding hydrocortisone at step 1 of the present study was not clear. The loss of synthetic steroid, evidently into the protein precipitate, is currently under investigation.

TABLE 5. *Recovery of hydrocortisone (compound F) added to plasma or plasma extracts*

Sample No.	F present in sample* (gamma)	F added to plasma (gamma)	F added to protein-free filtrate (gamma)	F found* (gamma)	F recovered (per cent)
1	2.66	2.0	0	2.85	61
2	2.66	4.0	0	4.70	71
3	2.66	6.0	0	5.10	59
4	2.27	2.0	0	3.04	71
5	2.27	4.0	0	4.32	69
6	2.27	6.0	0	4.82	58
7	3.38	0	2.0	5.46	101
8	3.38	0	4.0	7.28	99
9	3.38	0	6.0	8.36	89
10	2.80	0	2.0	4.80	100
11	2.80	0	4.0	6.65	98
12	2.80	0	6.0	8.70	99

*Each value mean of two determinations.

Physiologic levels. Fifty-two male subjects, age range 18 to 22 years, were studied at 0800 hours, using the procedure described in this report. A range of 9 to 82 gamma per 100 ml was found (table 6) with a mean of 41.2 gamma per 100 ml. Reddy and associates[4] recorded a range of 28 to 78 gamma per 100 ml, with a mean of 46 gamma per 100 ml, in 6 subjects studied at 0830 hours. The values of Brancaccio, D'Alessandro, and De Luca[6] on 59 subjects varied between 12 and 66 gamma per 100 ml, with a mean of 34 gamma per 100 ml; the time of blood collection was not recorded.

TABLE 6. *Plasma levels of total 17-hydroxycorticoids in male young adults sampled at 0800 hours*

Subject No.	17-OHCS (gamma/100 ml)	Subject No.	17-OHCS (gamma/100 ml)	Subject No.	17-OHCS (gamma/100 ml)
1	32.2	19	18.8	37	81.8
2	38.2	20	56.8	38	41.0
3	31.0	21	50.0	39	41.0
4	22.0	22	79.2	40	37.5
5	32.2	23	41.8	41	30.0
6	26.5	24	27.0	42	60.0
7	20.5	25	70.8	43	72.5
8	22.0	26	50.0	44	58.5
9	29.2	27	27.4	45	31.8
10	27.0	28	29.2	46	38.2
11	54.2	29	60.5	47	46.8
12	39.5	30	72.8	48	23.2
13	31.2	31	56.8	49	45.0
14	31.2	32	44.9	50	55.2
15	29.2	33	56.8	51	9.0
16	10.5	34	36.2	52	30.0
17	54.2	35	45.5		
18	20.8	36	63.8		

SUMMARY

A procedure evolved from modifications of existing technics for the estimation of total 17-hydroxycorticoids in blood has been described. The precision of the method based on the average difference between 95 sets of duplicates indicated a standard deviation of 5.48 and a coefficient of variation of 10.38 per cent. Essentially, quantitative recoveries (mean, 98 per cent) were obtained by adding hydrocortisone to protein-free plasma filtrates; relatively poor recoveries (mean, 65 per cent) resulted from addition of hydrocortisone to untreated plasma samples. A range of 9 to 82 gamma per 100 ml was found in a series of 52 subjects, with a mean of 41.2 gamma per 100 ml.

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AGE OF PATIENTS WITH BLEEDING ULCERS

An advance in the treatment of bleeding peptic ulcers has been the recognition that older people with this condition are more likely to bleed to death than are those who are younger. The dividing line between old and young is arbitrarily based at about the age of forty. In younger people the blood vessels are more likely to be soft and, when eroded, they can contract to stop the bleeding. On the other hand, in older people the arteries are more likely to be rigid with arteriosclerosis and unable to contract. Nearly all surgeons who have operated upon bleeding peptic ulcers have seen some older patients in which a rigid bleeding artery was projecting in the center of the ulcer. Accordingly we tend to operate earlier on older patients with bleeding ulcers than on those who are younger. No fixed rule is made, but in general an older patient who continues to bleed or has recurrence of bleeding after 1,000 cc. of blood has been administered is taken to the operating room. In younger patients the period of treatment by transfusion alone may be prolonged to eight or ten units of blood. I am convinced that this is an advance over the older method of postponing surgery until patients had stopped bleeding regardless of how many transfusions were necessary to keep him alive. Some patients were lost who might have been saved by operation and, there is good evidence that their number exceeds the mortality of the operation itself.—Richard T. Shackelford: Advances in Upper Gastrointestinal Surgery, *Connecticut Medicine*, March 1959.

PROBLEMS IN THE CONTROL OF INSECT DISEASE VECTORS

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AMERICAN troops in the Naples area in 1944 were threatened with one of war's worst scourges: an outbreak of louse-borne typhus. The danger was averted in a most dramatic way by the timely use of DDT, then a newly discovered insecticide. In 1951 the same threat arose in Korea. After three futile attempts at control with DDT, the compound was declared useless and the lice were finally brought under control by the use of lindane.

These episodes illustrate vividly the serious problem now confronting entomologists, both military and civilian. The overwhelming success of DDT against disease-carrying insects, and later against agricultural pests, persuaded many that the problem was not only solved, but completely eliminated. The disillusionment was great when one report after another showed that flies, mosquitoes, and other pest insects were no longer being killed by DDT. We are now dealing with strains of insects that are resistant, even immune, to the toxic effects of DDT and a dozen newer insecticides which have been brought into use with no greater success.

The outburst of enthusiasm following the first successes of DDT was, of course, confined to those who were not aware of the versatility of living organisms. Many scientists foresaw the course of events and began to work on the problem of resistance. The first investigations in the entomology laboratory of the Chemical Warfare Service were made in 1945, and by 1948 the "Edgewood" strain of resistant houseflies had been developed to the point of living in cages thickly coated with DDT. These flies, and many other laboratory stocks resistant to the new insecticides, show how wonderfully plastic these insects really are, and how quickly they become immune to many poisons used to control them.

Armed Forces entomologists and sanitarians are therefore left not without weapons, but with no confidence that their

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weapons will be effective at the moment when they are needed. When DDT failed, lindane, chlordane, and many other compounds were substituted, one after another. Finally, a group of organophosphorus compounds including parathion, malathion, and diazinon was rushed into use. Successful control of insect pests has been achieved with a number of these agents, but invariably such success proves to be but temporary. It is probable that in only a few unimportant geographic areas are there any insects not already exposed to chemical insecticides, and not resistant in some degree. At first resistance is not serious, and heavier doses of chemicals overcome it. At this stage the only results are the increased cost of control work and a heavier load on the supply system. Later, of course, control is lost and troops in the field are open to insect-borne epidemics until a new insecticide can be brought into play. Not only are costs increased and supply systems harassed, but advance stocking of insecticidal compounds must be done with care lest vast quantities of materiel become useless when insect pests become immune to their effects. The loss of combat troops by disease, and the drop in morale when epidemic diseases appear also must be counted among the dangers raised by the resistant strains of insects.

What is resistance? It is not a new phenomenon, merely a new and striking demonstration of that plasticity which has marked the evolution of living things. Our first experience of the resistance to chemical poisons by insects occurred long ago. African cattle ticks became resistant to sodium arsenite in 1937 and the California red scale insect became resistant to cyanide at least 10 years earlier.

Members of the World Health Organization's Committee on Insecticides[1] have defined resistance as "ability in a strain of insects to tolerate doses of toxicants which would prove lethal to the majority of individuals in a normal population of the same species." It does not arise by a specific effect of any chemical agent on the individual insect. It is a condition occurring in a group when all but a few are killed by the toxic agent. The survivors and their descendants differ from the others in some way, perhaps by their ability to detoxify the insecticide before it can kill them. In this way nearly all breeding is from resistant insects, and the new resistant strain predominates after several generations.

The ability to detoxify a chemical poison is startling, but it is one of the best established facts of resistance in houseflies.[2-4] The tissues of resistant strains of this fly contain an enzyme called dehydrochlorinase, which converts DDT to DDE, a nontoxic compound. Another way in which some insects have been shown to become resistant is by storage of the agent in some tissue, usually fatty, where it remains harmless. Still

other insects exhibit what is called behavioristic resistance, that is, while they can be poisoned by contact with an insecticide, they avoid such contact by a change in their habits. African mosquitoes frequently enter native huts, bite the inhabitants and then rest on the house walls while digesting the blood meal. In many places, after huts had been sprayed to kill these resting mosquitoes, they were found to be leaving the huts promptly and resting in trees outside. This type of resistance is just as effective as detoxication in ensuring survival of the insect.

The ultimate causes for resistance are genetic.[1] Individual insects differ in form, size, and other ways, even though a group may seem to be alike. The presence or absence of a dehydrochlorinase is, for example, governed by genes. If we assume a simple, but quite possible arrangement, a dominant gene R will produce the enzyme and ensure resistance. In a population of flies, three kinds can exist, RR, Rr, and rr. When subjected to an insecticide such as DDT, RR and Rr will survive, rr individuals will be susceptible and die. In the next generations fewer and fewer rr individuals will appear, and eventually a wholly resistant stock will exist. Should the resistant gene be a recessive, the rate of change will differ, but the end results will be the same. Studies have shown that many known resistant strains are in fact governed by such simple single gene factors. Others are known to be controlled by more than one gene.

Although we now know a great deal about resistance, it is only a fraction of the information which we must have if we are to deal effectively with the problem. Indeed, the magnitude of the problem is even now growing faster than our research effort. Practical and reliable methods for measuring the degree of resistance in any given population are being developed and put into use. The frequent measurement of resistant levels will also tell us the rate at which it develops, which permits a prediction of the time when any insecticide will become valueless. These checks will also tell us whether reversion to susceptibility occurs when insecticide treatments are stopped. Some strains of insects revert rather quickly, others seem to remain resistant. Even when they do revert to normal, however, the reapplication of insecticides brings back resistance more rapidly than it developed at first.

One of the reasons why we have so quickly exhausted the usefulness of the dozens of new insecticides is the phenomenon known as cross-resistance. A strain of insects which becomes resistant to DDT, for example, is also found to be resistant to other compounds having similar chemical structures. It is, therefore, not practical to substitute one insecticide after another as resistance develops. It has been found that all of our current insecticides fall into a relatively small number of groups, such

as the chlorinated hydrocarbons (DDT), the cyclodiene derivatives (dieldrin), and four or five others. Changes must be made from group to group, rather than from one compound to another.

The maintenance of control over insect pests and disease vectors is not to be as easy as we hoped a few years ago. Neither is it hopeless. If we make the best possible use of our present knowledge and technics we should be able to hold the line until research provides better materials and methods. The indiscriminate use of insecticides has been the cause of much of the resistance which now exists. We have learned that the persistence of compounds like DDT, which gives long-term killing power to coatings on house and barn surfaces, increases the chances of resistance. We know that resistance increases faster when insecticides are used against larvae rather than adults. The proper use of this information can prolong the effective life of an insecticide. The reduced use of insecticides should be accompanied by greater emphasis on sanitation.

Research must proceed in a number of paths. Biological control, like sanitation, has received little attention of late, but seems to offer good possibilities. This requires study of the predators and parasites of insect pests. Practically all animals are held in check to some extent by their natural enemies, and we can help ourselves by encouraging the destruction of insect pests by such means. It is also possible that bacteria, viruses, and fungi can be utilized in many ways to reduce insect populations.

Insecticide research has by no means reached the end of the road. We still need insecticides of greater specificity, so that we can kill those insects which are undesirable and leave untouched the bees, butterflies, and others which we wish to preserve. The use of synergists, that is, compounds not especially toxic themselves, but which increase the effect of insecticides, can extend the usefulness of the chemicals we are now employing.

A relatively new discovery suggests a way of reversing the development of resistance. Japanese investigators[5] have reported that a DDT-resistant strain of fruit flies is susceptible to phenylthiocarbamide, and that there is a single gene which governs this phenomenon. This makes it possible to use DDT against such flies until resistance appears, then the original state can be restored by the use of phenylthiocarbamide. The alternation of these two compounds should be effective against fruit flies indefinitely. If such lethal alternate compounds can be found for use against the pests and disease vectors which we need to control, the present difficulty will be eliminated.

Two other effective methods of controlling insects are now being developed. Properly used in favorable places, they can

go far to keep insect pests under control. The World Health Organization is endeavoring to eradicate malaria by an intensive area by area attack on anopheline mosquitoes. Earlier mosquito control campaigns were not thorough, and surviving mosquitoes were able to generate resistant populations. The World Health Organization now plans to use all available means to eliminate the mosquito population in areas where malaria is prevalent. It is believed that mosquito populations can be reduced to the level where propagation will become impossible, and the cycle of infection between humans and mosquitoes will be broken.

The other attack is being conducted against the screwworm fly *Callitroga hominivorax* (Cgrl.) in Florida. This pest causes millions of dollars worth of damage to cattle. Cold weather kills these insects; it is therefore impossible for them to spread north into Georgia. Once eliminated from the Florida peninsula, they will be gone for good, because there is no nearby reservoir from which the state can be reinfected. The U. S. Department of Agriculture has inaugurated a campaign which is already showing excellent results. It is based on the use of a powerful radiocobalt unit in which each week millions of screwworm flies are rendered sterile. The dose necessary to produce this result does not impair the activities of the flies, and they are then dispersed throughout the state by airplanes. The object is to saturate the state with sterile male flies so that wild females will mate with them more frequently than with fertile wild males. Eggs laid by these females will not hatch, and a steady reduction of the wild population results. With 50 million sterile flies being released weekly, annihiliation of the screwworm is expected in about a year.

The attacks on malaria carrying mosquitoes and the screwworm fly are operations which can only succeed in selected places, against specific pests. They do, however, show the kind of imaginative programs which are now possible. Control measures on such large scales, based on well-planned research programs, will undoubtedly extricate us from the predicament we are now in as regards to insect pests.

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INCIDENCE OF CUTANEOUS ERUPTION DUE TO SULFAMETHOXYPYRIDAZINE

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SULFAMETHOXYPYRIDAZINE is a N-substituted sulfonamide derivative.[1] Clinical trials and in vitro sensitivity tests with gram-positive bacteria have shown it to be as antibacterial as sulfadiazine.[2,3] The pyridazine ring structure is thought to account for the drug's effectiveness in the control of dermatitis herpetiformis.[4,5]

During a 12-month period, patients who presented the usual clinical indications for treatment with a sulfa drug because of bacterial upper respiratory or urinary tract infections, were given 1 gram of sulfamethoxypyridazine (SMP) initially and 0.5 gram daily for 7 days. After excluding from this study those who had previously reacted unfavorably to a sulfa drug, or a combination of drugs with a sulfonamide, 223 patients remained. Explanations were made to the patients to ensure their cooperation. All members of the group were examined during and at least 2 weeks after treatment to evaluate reactions to the drug. The patients ranged in age from 15 to 70 years, and there were twice as many women as men.

To establish the incidence of reported previous reactions to the sulfa drugs, a separate group of 800 patients at our clinic was studied. Of these patients, 5.3 per cent claimed to have had a cutaneous eruption or fever after their ingestion. Because this figure includes problems of recall and diagnosis, it exceeds the true incidence of allergic sensitivity to sulfa drugs.

In our series of 223 patients receiving SMP only on a standard dosage program, reactions occurred in 6 (table 1), an incidence of 2.7 per cent. All of the reactions included a cutaneous eruption.

Inasmuch as a wide variety of adverse reactions to the sulfa drugs has been described [6,7] and can be expected to occur with

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Kynex, brand of sulfamethoxypyridazine, made by Lederle Laboratories, was used in this study.

Case No.	Sex	Age (years)	Day of therapy eruption appeared	Description of cutaneous eruption	Other signs of sensitivity	Duration of reaction (days)	Remarks
1	Female	32	3	Generalized maculopapular rash; more pronounced in exposed areas	WBC — 1,200 Malaise, fever, adenopathy	10	WBC → 5,000 in 4 days with steroid treatment
2	Female	36	5	Sun-sensitive type with purpura	Malaise, fever, adenopathy	6	No blood changes
3	Male	36	8	Maculopapular, with purpura	Malaise, fever, adenopathy	5	No blood changes
4	Female	30	9	Maculopapular, sun-sensitive areas with mild purpura	Low-grade fever	3	No blood changes
5	Male	34	13	Maculopapular; few urticaria	None	3	No blood changes
6	Male	54	6	Urticaria, giant	None	1	No blood changes

the use of SMP, repeated clinical and laboratory studies of each reaction occurring in our patients were made. Each patient was seen by a dermatologist who confirmed that the cutaneous findings were characteristic of sulfa drug reactions. The one patient who became febrile and developed a leukopenia showed a surprisingly rapid recovery, and had negative cephalin-cholesterol flocculation tests during and after the period of eruption.

Dorn[8] discussed the many problems of experimental design in drug reaction studies. The mode of selection and the dosage must be uniform. The patients must be instructed carefully and consistently followed up. Obviously, such a study cannot be a retrospective evaluation of clinical records. A 12-month period for collecting cases includes seasonal variation and can be conveniently repeated.

The incidence of allergic reactions to sulfa drugs is greater when larger doses are used.[9] In treating 85 patients with different amounts of SMP, Lindsay and associates[10] reported a 16 per cent incidence of dermatitis, 14 per cent of which occurred in patients receiving 1 gram or more of SMP daily. Jackson and Grieble,[11] using 1 gram of SMP daily, noted a 7.2 per cent incidence of dermatitis in 56 patients. It is doubtful that a sulfa drug causing an incidence of allergic reactions greater than 5 per cent would be acceptable regardless of its antibacterial value.[12] If patients are not instructed in the use of SMP, they may erroneously prescribe for themselves the dosage used with the more familiar sulfa drugs.

SMP is readily absorbed when taken by mouth, has a satisfactory solubility in urine, and a low rate of renal clearance. These properties allow an antibacterial blood level to be maintained on small daily dosage. An accepted therapeutic blood level is 10 to 15 mg of the free drug per 100 ml of plasma. Patients receiving 0.5 gram of SMP daily will average blood levels in excess of 10 mg per 100 ml. A similar level in children may be obtained with a daily dosage of 50 mg per kg body weight.[13] A daily dose of 1 gram of SMP will raise the plasma concentration to 15 mg per 100 ml and prolong it.[3] One study showed that increasing the daily dose beyond 2.5 grams serves only to sustain the blood levels without elevating them.[11,14] The larger dose may be necessary in treating some urinary tract infections[3] and to obtain spinal fluid concentrations comparable to those shown in treatment with other sulfa drugs.[15]

Sulfa drugs are effective in the treatment of epidemic cerebrospinal meningitis, bacillary dysentery, trachoma, and cholera. Sulfonamides in combination with streptomycin sulfate is indicated in the treatment of brucellosis, bubonic plague, Friedländer's pneumonia, and infections caused by *Hemophilus* influenzae.[16] Histoplasmosis[17] and South American blastomycosis also respond to sulfa drugs.

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SUMMARY

Sulfamethoxypyridazine is an antibacterial agent which sustains adequate blood levels with small daily doses. A 12-month study of 223 patients using this drug showed the incidence of reactions to be 2.7 per cent. All of the patients reacting unfavorably recovered quickly. The apparent safety of the drug with the dosage used in our patients recommends its further evaluation.

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THE ROLE OF THORACOTOMY IN THE DIFFERENTIAL DIAGNOSIS OF PLEURAL EFFUSION

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IT has long been axiomatic that primary pleural effusion in tuberculin-positive individuals must be considered to be tuberculous until proved otherwise. The basis for this axiom arose in the pre-chemotherapy era when an appallingly high breakdown rate with significant tuberculous manifestations was noted in patients with pleural effusions followed for over five years.

Roper and Waring,[1] for instance, reported an over-all five-year breakdown rate of 65.2 per cent in 141 patients treated in Army hospitals in the years 1944 and 1945. The breakdown rate was 90.9 per cent in those patients in their series treated with less than six months of bed-rest, and 30.6 per cent in those patients receiving over six months of bed-rest. Thus, while the tuberculosis relapse rate remained appallingly high, even with the best of treatment, there was certainly a marked difference ascribable to prolonged bed-rest.

Compton[2] is currently reviewing 205 cases treated at Fitzsimons Army Hospital in the years 1953 through 1956, and he has been unable to find any case of relapse to date in any patient who has received adequate chemotherapy by present-day standards. Personal observation by this author would bear out Compton's findings. A great number of patients who were put on temporary retirement from military service following pleural effusion have been observed in follow-up reviews for a considerable period of time. In none of these patients has there been any subsequent breakdown with significant tuberculosis, provided the original course of treatment was adequate.

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In view of the high breakdown rate of untreated pleural effusions and the excellent prognosis with adequate treatment, the natural tendency at Fitzsimons Army Hospital, as well as in most other institutions dealing with tuberculosis, is to bend over backward and treat all cases where there is any doubt as to the possibility of a tuberculous etiology of a given pleural effusion. We fully realize that this policy has resulted in unnecessary treatment in many patients who probably were not tuberculous, but in whom the diagnosis of tuberculosis could not be disproved. Because of the danger of withholding treatment, the presumption of guilt until innocence is proved has been the policy in the management of pleural effusion in recent years. Inevitably this has led to a certain amount of unnecessary emotional trauma, family hardship and economic loss. In an economic sense there has been unnecessary cost of hospitalization and treatment, and, in the unique problem which arises in the Armed Forces, we are certain that many have been paid medically unnecessary pensions for many years. Heretofore, this has always been considered a necessary price to pay for the safety of the individual for the reasons outlined above.

From the foregoing, it follows logically that if a method of differential diagnosis could be found which could be relied upon with a high degree of accuracy, it would be possible to eliminate most nontuberculous cases and reserve prolonged chemotherapy for proved or strongly presumptive cases. It would also be possible in many instances to establish a definitive diagnosis for the nontuberculous group of effusions and to institute proper treatment as indicated.

It has seemed to us that, in selected cases, diagnostic thoracotomy with careful examination of the resected material offers a rational approach. However, certain factors must be considered which might possibly limit the value of thoracotomy. Foremost of these is the influence of chemotherapy on the morphology and bacteriology of a pleural effusion. Many cases have been on antituberculous drugs for a considerable period before they are considered for surgery. Most surgeons are loath to operate on cases of possibly active tuberculosis without the adequate preoperative protection offered by chemotherapy. Thus, the influence of these drugs on tuberculous pleuritis will have to be determined.

The next problem is one of surgical exposure. A punch biopsy or limited surgical procedure might pick up a relatively normal area and overlook adjacent significant pathology, and thus give falsely negative results. Breckler, Hensler et al.[3] have recently reported on limited open biopsy technic in pleural effusion in a small series of cases. They feel they can differentiate tuberculous effusions from nontuberculous effusions on morphologic bacteriologic

grounds in about 80 per cent of cases. This is good but far from ideal, and a number of cases given tuberculosis clearance by use of their technic are liable to subsequent breakdown with significant tuberculosis when their series is large enough. After all, their preliminary estimate would indicate that they will overlook about 20 per cent of cases of tuberculous pleural effusion.

Donohoe et al.,[4] in an excellent paper, point out the value of aspiration biopsy of the parietal pleura. In their hands this simple procedure has been without risk, and it establishes a pathologic diagnosis of granulomatous pleuritis in a high percentage of cases without resort to more extensive procedures. However, these authors emphasize that a negative biopsy or findings of nonspecific pleuritis by no means exclude tuberculosis, since a relatively high proportion of their negative needle biopsy findings was found to have granulomatous pleuritis at subsequent open thoracotomy.

Needle biopsy, when positive, would therefore seem to confirm a diagnosis of granulomatous pleurisy, but negative findings are of no value in their exclusion of tuberculous etiology.

To shed some light on this problem, and possibly to offer better differential criteria for tuberculous versus nontuberculous pleuritis, the records of 63 patients who received open thoracotomy for pleural disease at Fitzsimons Army Hospital during the years 1953 through 1956 have been carefully analyzed and reviewed, and our findings in these 63 cases will form the basis of this paper. A few of these patients were probably included in a previous paper by Stead, Eichenholz, and Stauss;[5] however, the present review was made independently, and no effort was made to correlate the cases reviewed at this time with the cases reviewed in any previous study.

ANALYSIS OF CASES

Sixty-three cases who received open thoracotomy during the years 1953 through 1956 are reviewed (table 1).

All cases had pleural involvement which either was due to tuberculosis, or at some point in the course of the disease the possibility of tuberculous pleuritis was seriously entertained or could not be clinically excluded.

The final diagnosis in 38 cases was tuberculosis, and the remaining 25 patients were considered to have nontuberculous pleuritis. The indications for thoracotomy were primarily diagnostic in 17 cases. In 14 cases the indication was both diagnostic and therapeutic, and in the remaining 32 patients thoracotomy was primarily a therapeutic procedure.

Thus, in half of our cases the operation was done at least in part for diagnostic consideration, and in the other half primarily for therapeutic indications.

TABLE 1. *Thoracotomy data on 63 patients*

Indications	
Primarily diagnostic	17
Diagnostic and therapeutic	14
Primarily therapeutic	32
	63
Procedures	
Decortication	57
Open pleural biopsy	6
	63
Pulmonary tissue obtained	30
Hilar node biopsy	1
Cervical node biopsy	1
Pericardial biopsy	1
Disposition by discharge diagnosis	
Tuberculosis	38
Nontuberculous	25
	63

In 63 thoracotomies, 57 cases were decorticated and six received open pleural biopsy in the course of a full exploratory thoracotomy.

Pulmonary tissue, either wedge, segment, lobe or limited biopsy, was obtained in 30 of the 63 cases. In one patient a hilar node biopsy was obtained, and in one a cervical node biopsy was obtained at the time of thoracotomy. One patient had a pericardial biopsy.

SKIN TESTS

In the 38 cases with an ultimate diagnosis of tuberculosis the PPD was positive in 35 cases and was not done in the remaining three, each of whom had proved pulmonary tuberculosis with positive sputum. In the 25 cases ultimately given tuberculosis clearance the PPD was positive in 18 and negative in seven. This would indicate that a positive tuberculin proves nothing as to the etiology of a given effusion, but that a negative tuberculin would be strongly presumptive evidence that a given effusion was not tuberculous (table 2).

Of course, the usual precautions regarding freshly prepared testing solutions, proper reading of skin tests, and repetition of the tuberculin test to rule out tuberculin conversion following

acute pleural effusion as a manifestation of acute primary tuberculosis should be observed.

TABLE 2. *Skin test results*

Tuberculin	Pos.	Neg.	Not done
Final tuberculosis diagnosis	35	0	3*
Final nontuberculosis diagnosis	18	7	0

*All obvious active pulmonary tuberculosis with positive sputum.

In practically all of our cases, skin tests were also done for histoplasmosis and coccidioidomycosis; eight cases had a positive histoplasmin skin test associated with a positive tuberculin and a negative coccidioidin. Seven cases had a positive coccidioidin associated with a positive tuberculin and a negative histoplasmin. Three patients were positive to all three antigens.

In this series, which represented a high incidence of diagnostic problems, all the positive fungus skin tests occurred in association with a positive tuberculin test. Thus, fungus skin testing added one more diagnostic possibility in 15 cases and two additional possibilities in three cases, but failed to be of any value in eliminating tuberculosis from the differential diagnosis.

In general, therefore, positive skin tests add to the possibilities but diagnose nothing. However, negative skin tests are of value in eliminating tuberculosis from consideration.

PLEURAL FLUID FINDINGS

In 49 of our 63 patients, one or more taps are recorded. The description of the pleural fluid varies widely from record to record, so that comparison is difficult. However, there do not seem to be any specific characteristics that consistently separate tuberculous from nontuberculous effusions.

Seven of the 49 patients had a culture positive for tubercle bacilli, or positive results from guinea pig inoculation of the thoracentesis fluid on at least one occasion. Positive findings usually were obtained during the initial diagnostic phase prior to any intensive chemotherapy. One patient had a positive smear which was unconfirmed on culture. Positive smears without cultural confirmation are always open to a certain amount of question as to their validity. We are thus left with seven sure and one probable bacteriologic confirmation from tests of the pleural fluid out of 38 proved tuberculous pleural effusions. Pleural fluid bacteriology, therefore, was reliable in proving the diagnosis in only 21 per cent of our tuberculous pleural effusion cases. This percentage is entirely too low to make negative pleural fluid bacteriology of any value in eliminating tuberculosis from the differential diagnosis.

SPUTUM AND GASTRIC ANALYSIS

Sixteen of the 38 tuberculosis patients in our series had at least one positive finding reported on examination of their sputum and/or gastric aspirate. Fourteen of these patients had cultural confirmation, and two had positive smears unconfirmed by culture. It is interesting to note that five of our 16 patients with positive bacteriologic findings had no evidence of parenchymal pulmonary disease clinically, and no evidence of a parenchymal lesion was described at thoracotomy. One patient had no clinical or x-ray evidence of pulmonary disease except for his pleural effusion, but definite evidence of parenchymal tuberculosis was found at surgery. The remaining nine patients had obvious active pulmonary disease.

The foregoing would seem to indicate that a relatively high proportion of patients with pleural effusions have active pulmonary or endobronchial foci so small as to escape detection by conventional methods, but still capable of producing positive bacteriologic findings during the acute phase of the disease if diligently repeated sputums or gastric aspirates are obtained.

On the other hand, positive bacteriologic findings may at times be misleading. One of our patients had two positive sputum cultures reported with negative guinea pig inoculations from these cultures and numerous subsequent negative gastric cultures. His PPD was persistently negative on 12 examinations, and at thoracotomy no demonstrable tuberculosis was found. This man was given final clearance as not having tuberculosis as a result of his thoracotomy findings, which revealed a hiatus hernia and a post-traumatic fibrous pleuritis. It is felt that in this case the positive cultures represented a laboratory error but one which which was exceedingly difficult to resolve.

Since only about 40 per cent of our tuberculous effusions had even one single positive bacteriologic finding, and many of these cases had known pulmonary disease in addition to their pleural involvement, it is felt that the incidence of positive sputum or gastric findings is too low to give a reliable index as to whether a given effusion is or is not tuberculous.

PULMONARY AND NONPLEURAL DISEASE

Many of our cases had disease in addition to their pleurisy. For purposes of discussion, the 25 nontuberculous cases will be discussed separately from the 38 cases with a final diagnosis of tuberculosis (table 3).

Seven of the nontuberculous cases had no demonstrable pulmonary disease preceding or associated with their pleural effusion, either clinically or found at surgery. These seven cases were felt to be nonspecific pleural effusions of nontuberculous origin. The pathologic findings were those of chronic fibrous

pleuritis. Seven additional cases had a history of pneumonia preceding their pleurisy. Three patients had surgically proved bronchiectasis associated with pneumonitis and pleural effusion. In two patients, pulmonary fibrosis and/or emphysema was present which may have played some role in the etiology of their effusion. One patient had collagen disease manifested by a rheumatoid type of arthritis and an associated pleural effusion. One patient had an old history of rheumatic fever with rheumatic heart disease, and his pleural effusion was felt to be on a rheumatic basis. The pathologic findings in this case were compatible with a rheumatic pleuritis.

TABLE 3. *Significant conditions possibly related to pleurisy in 25 cases with nontuberculous discharge diagnosis.*

Previous pneumonia	7
Bronchiectasis (surgically proved)	3
Pulmonary fibrosis and emphysema (surgically confirmed)	2
Histoplasmosis (surgically proved)	1
Coccidioidomycosis (surgically proved)	1
Granuloma, etiology undetermined, probably histoplasmosis or coccidioidomycosis (surgically removed)	1
Diaphragmatic hernia containing omentum, post-traumatic (surgically diagnosed)	1
Collagen disease, unclassified, manifested by arthritis and pleural effusion	1
Rheumatic heart disease with rheumatic pleuritis	1
Nonspecific pleuritis No other condition clinically or found at thoracotomy to explain pleural effusion	7
Total	25

Three patients had a subpleural pulmonary granuloma discovered and proved at the time of surgery. There was one case of histoplasmosis and one of coccidioidomycosis, and the third case was discharged with the diagnosis of granuloma, etiology undetermined. This man had positive skin tests for histoplasmosis and coccidioidomycosis as well as a positive PPD. The morphology of the resected granuloma was more suggestive of fungus infection than of tuberculosis. One case was discovered at surgery to have a diaphragmatic hernia containing omentum which was associated with a post-traumatic pleural effusion.

Thus we see that 18 of our patients had some underlying involvement which might have explained their pleural effusion, and in nine of these cases thoracotomy either established or confirmed significant pathology which might have been missed clinically or overlooked by limited diagnostic biopsy. To our mind, this would argue strongly in favor of an open exploratory

thoracotomy versus a more limited procedure in establishing a satisfactory differential diagnosis.

In our experience the most common causes for nontuberculous pleuritis are, in order of frequency:

1. Nonspecific or idiopathic pleural effusion.

2. Postpneumonic pleural effusion.

3. Pleural involvement secondary to bronchiectasis or granuloma.

Of the 38 cases given a discharge diagnosis of tuberculosis (table 4), pulmonary tuberculosis was known and established prior to surgery in 14 cases. In 13 cases no pulmonary disease was clinically demonstrated and no pulmonary parenchymal involvement was found at surgery. In nine patients there was no clinical or x-ray evidence of any disease other than pleural effusion; however, definite pulmonary lesions were palpable and removed at thoracotomy. In one patient an unsuspected tuberculous pericarditis was discovered at surgery. One patient had a pleural effusion following a proved tuberculous meningitis with no evidence of pulmonary disease and nonspecific pleural findings at thoracotomy. This case will be discussed in detail later on in the paper.

TABLE 4. *Significant tuberculosis conditions associated with pleural effusion in 38 patients with discharge diagnosis of tuberculosis.*

Pulmonary tuberculosis	
Parenchymal disease known prior to thoracotomy	14
Parenchymal disease, unsuspected clinically or by x-ray, discovered and pathologically confirmed as result of thoracotomy	9
Tuberculous pericarditis, clinically unsuspected, diagnosed at thoracotomy	1
Tuberculous meningitis associated with pleural effusion	1
"Pure" tuberculous pleural effusion—no other manifestations of tuberculosis either clinically or at thoracotomy	13
Total	38

We feel it is highly significant that, in 10 out of 38 cases, important evidence of tuberculosis other than pleurisy, unsuspected clinically or by x-ray, was discovered at thoracotomy. This would help to explain the not uncommon clinical observation that a positive sputum or a positive gastric aspirate may be found in what appears clinically to be a pleural effusion, without other demonstrable disease. We feel that this is an important argument in favor of full exploratory thoracotomy as opposed to the more limited biopsy procedures.

The high coincidence of small but definite parenchymal foci in cases of tuberculous pleural effusion has been noted by many

observers for a great many years, and is by no means an original observation. Stead et al.[5] report that in 12 out of 15 patients with tuberculous pleural effusion, definite subpleural parenchymal foci were demonstrated at the time of thoracotomy.

Figure 1. Biopsy specimen, showing a normal pleura with subpleural pulmonary tuberculous granuloma.

PATHOLOGIC FINDINGS

The original pathology reports were reviewed and the cases were classified as tuberculous or nontuberculous on the basis of these reports, as follows:

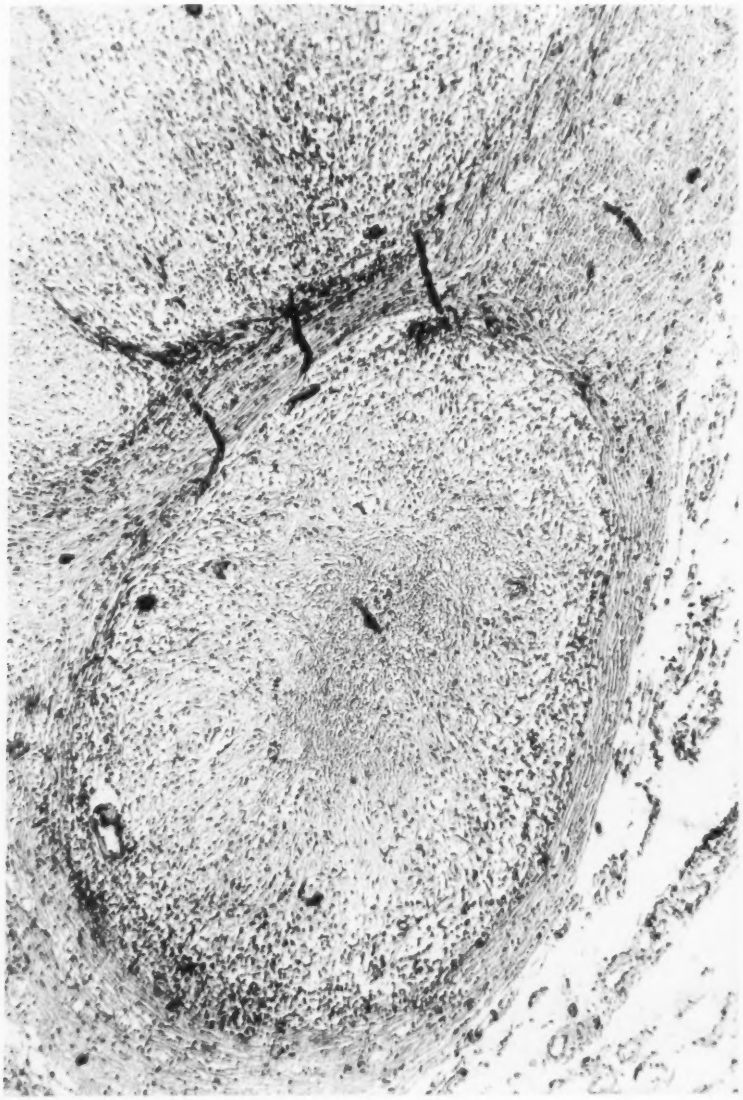

Figure 2. Definite tuberculous pleuritis—organized caseating granuloma.

Nonspecific inflammatory change or definitely nontuberculous pathology was reported in 28 cases. Tuberculous pleuritis or granulomatous pleuritis compatible with tuberculosis was reported in 32 cases. In three additional cases the pleural biopsy findings were nonspecific, but definite tuberculosis was con-

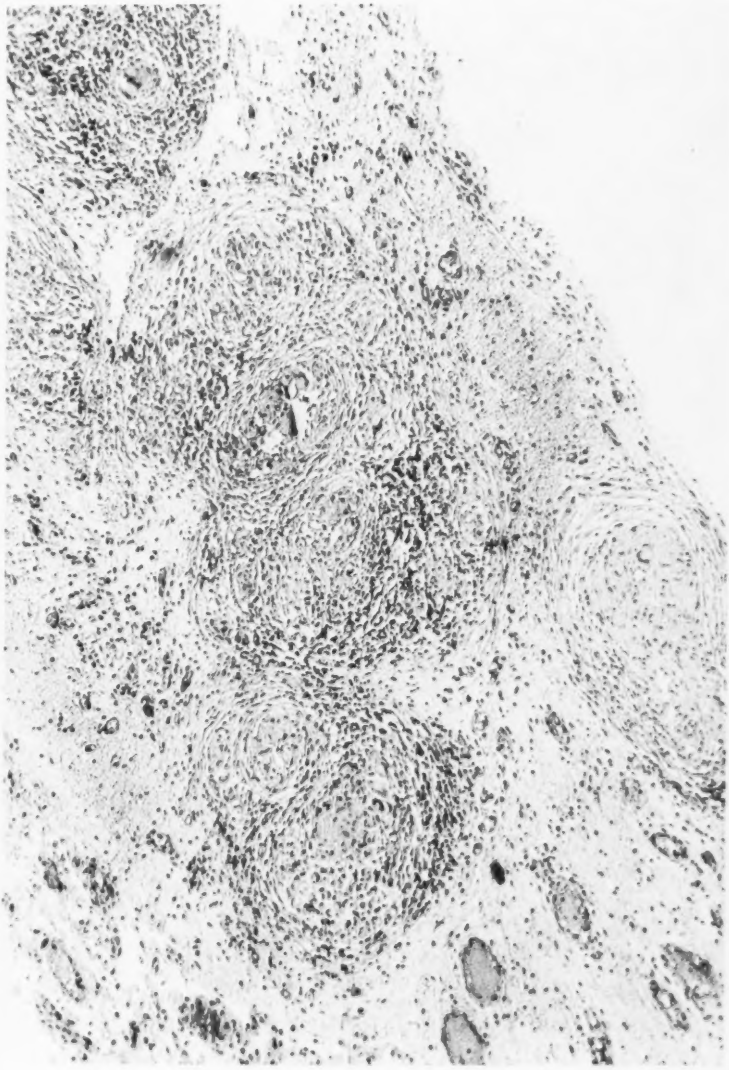

Figure 3. Probable tuberculous pleuritis—organized noncaseating granuloma.

firmed by pulmonary tissue removed at the time of surgery (figure 1). Thus, in 32 of 38 cases the pleural pathology was confirmatory and the combined pleural and pulmonary tissue pathology

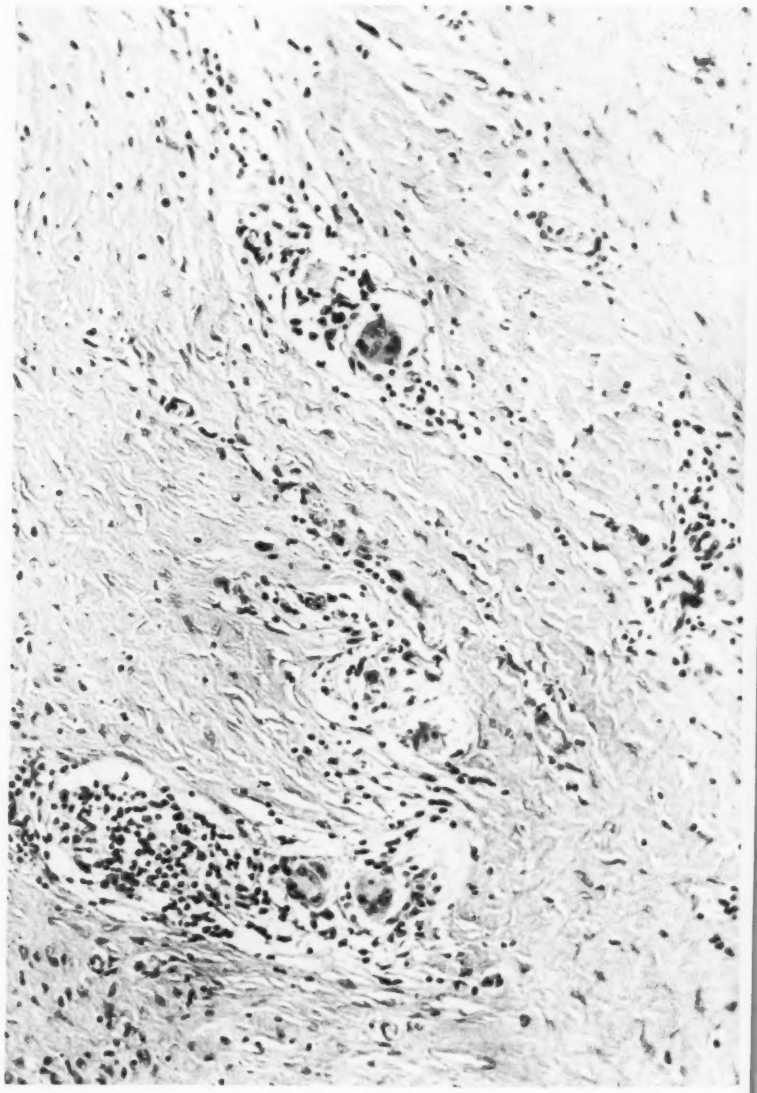

Figure 4. Borderline granulomatous pleuritis—fibrous tissue, lymphocytes, giant cells and a few epithelial cells. Lesion is neither discrete nor circumscribed.

confirmed the diagnosis in 35 of 38 cases in this series, and for an accuracy of approximately 92 per cent. In three cases there was considerable disagreement, negative pathologic findings having been obtained, but a final diagnosis of tuberculosis

Figure 5. Definitely nontuberculous pleuritis—nonspecific inflammatory reaction with no morphologic features suggestive of tuberculosis.

was nonetheless made. These three cases will be reported in considerable detail. However, it would seem to us that open thoracotomy with adequate exploration should confirm or exclude the diagnosis of tuberculosis in almost all cases, and it should permit us to make a valid presumptive diagnosis of no tuberculosis if the pathology findings at full thoracotomy failed to reveal any evidence of granulomatous pleuritis and no granulomas were palpable in the lung.

In order further to confirm or deny the validity of the pathologic findings, the slides of all 63 cases were submitted without any clinical information for review by the pathologist co-author (H. H. H.) and were classified on the basis of morphology as definite tuberculosis, probable tuberculosis, borderline granuloma, or definite nontuberculosis, according to the following criteria:

Definite tuberculosis (organized caseating granuloma, figure 2): A granuloma consisting of a circular or oval arrangement of tangled or palisaded epithelioid cells, containing Langhans' type giant cells, surrounding a central mass of eosinophilic granular or fibrillar necrotic material. The nodule is circumscribed by a narrow rim of loose fibroblastic or fibrous connective tissue, infiltrated and surrounded by lymphocytes. The presence of acid-fast bacilli on appropriate staining is also considered as confirming definite tuberculosis.

Probable tuberculosis (organized noncaseating granuloma, figure 3): A granuloma having the same appearance as described above, but without central necrosis.

Borderline granuloma (morphologic commitment impossible, figure 4): Irregular, often fusiform collections of lymphocytes situated in fibrous tissue and associated with giant cells of the foreign-body type. There may be foamy macrophages, granulation tissue and even necrosis. Epithelioid cells are rare. The lesion is neither discrete nor circumscribed by loose fibrous tissue.

Definite nontuberculosis (figure 5): Mature fibrous connective tissue marked by diffuse and focal collections of lymphocytes, plasma cells, eosinophils or even neutrophils.

Comment: These criteria are based on the assumption that the disease process is still relatively recently active. Completely healed tuberculous pleuritis may not differ from non-tuberculous pleuritis in its histologic appearance.

Table 5 demonstrates that this review, within small limits of error, concurs with the results obtained on review of the original pathology reports. It is thus felt that morphologic criteria should be quite satisfactory in separating tuberculous from nontuberculous lesions.

TABLE 5. *Pathologic diagnosis based on study of resected specimens*

	Tuberculous pleuritis		Nondiagnostic pleural findings, TB diagnosed on basis of resected pulmonary tissue	Total path. diagnosis of TB or probable TB	Borderline granuloma	Definite non-TB diagnoses	Slides lost or not definitely identified	Total
	Definite	Probable						
Original pathology report	32*		3	35	0	28	0	63
Review of slides submitted as unknowns	27	1	5	33	3	26	1	63

*No division as to definite or probable

CASE REPORTS

Cases in Which the Morphologic Diagnosis Differed from the Final Diagnosis

Case 1. A 25-year-old Negro private was admitted to Fitzsimons Army Hospital in December 1952, following a spontaneous pneumothorax on the right, at which time x-ray revealed moderately advanced right upper lobe tuberculosis. PPD No. 1 was positive. Sputum was positive for tuberculosis organisms on concentrate and culture from December 1952 through February 1953. Subsequent cultures were all negative. Following his spontaneous pneumothorax the patient developed a tuberculous empyema on the right, with pleural fluid which at first was clear and later was purulent. A positive culture for tubercle bacilli was obtained from the pleural fluid on 24 February 1953.

On 16 July 1953, following six months of therapy with streptomycin and isoniazid (INH), the patient had a decortication on the right for treatment of empyema. No pulmonary tissue was obtained at the time of surgery. The pleura revealed nonspecific inflammatory pleuritis. Tissue sections, smears and cultures of the decorticated pleura were all negative for tubercle bacilli.

On 1 April 1954, at which time the patient had received 15 months of streptomycin-INH therapy, he had an excision of his sinus tract and drainage of a mixed infection empyema. Again the pathology showed nonspecific pleuritis, and the bacteriology was all negative.

The patient was discharged on 30 September 1954, with inactive tuberculosis, and at the time of his latest follow-up (6 August 1956), he was clinically well and working.

Review of tissue sections submitted as "unknown" at the time of the present study also resulted in a diagnosis of nonspecific inflammatory pleuritis and the sections were classified as definitely "non-tuberculosis."

Comment: This patient appears to represent a "clean miss" as far as the pathology is concerned. He had a well documented case of tuberculosis with a positive culture of the pleural fluid five months prior to his original surgery. It is conceivable that

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mixed infection elements were present in this empyema which completely obliterated the expected morphologic findings of tuberculous granulation tissue. Indeed, this is the only possible explanation in this case. Since no indication existed clinically for resectional surgery in this patient, no lung tissue was removed. However, had this been done, there is no doubt that pathologic confirmation of his pulmonary tuberculosis would have been obtained.

Case 2. A 19-year-old Negro female, in August 1954, developed meningeal symptoms accompanied by a left-sided pleural effusion. PPD No. 1 was positive. Spinal fluid revealed 250 white blood cells with 98 per cent lymphocytes; sugar, 38 mg per cent; protein, 360 mg. Cultures of the spinal fluid, as well as repeated sputums and gastric aspirates, were all negative for tubercle bacilli. No thoracentesis was ever performed.

The patient was placed on intensive antituberculous therapy, with immediate, dramatic clinical improvement, and was clinically perfectly well at the time of surgery.

On 1 June 1955, the patient received a left decortication for residual pleural thickening with functional impairment of the left lung. At the time of surgery she had received six months of triple drug therapy, plus four additional months of streptomycin-INH.

The pathologic findings were those of chronic fibrous pleuritis. Tissue sections, smears and cultures were all negative for tubercle bacilli.

The patient was discharged on 6 August 1955, as inactive tuberculous meningitis and inactive tuberculous pleural effusion. Her last follow-up was on 26 March 1957, at which time she remained perfectly well.

Review of pleural sections at the time of the present study again resulted in the diagnosis of chronic fibrous pleuritis, definitely nontuberculous.

Comment: In this case the presumption of tuberculous meningitis with tuberculous pleural effusion is exceedingly strong clinically, even though it was never proved bacteriologically. Since the effusion was part of an acute manifestation of early disseminated disease and the patient had received adequate intensive chemotherapy prior to surgery, it is felt that this patient very likely had had a complete cure of her tuberculous pleuritis by the time of surgery.

Case 3. A 30-year-old white male sergeant had had a pneumonic process in the right hilar area in June 1953, following which he had had six or seven repeated attacks of right-sided pleuritic pain prior to his admission in June 1955, at which time he had considerable pleural thickening on the right side, and repeated attempts at thoracentesis were all unsuccessful.

This patient had a positive PPD skin test, in addition to which he had positive histoplasmin and a positive coccidioidin skin tests. Serologic studies for fungi were all negative. His sputum was reported as positive for tubercle bacilli on direct smear on 7 June and 8 June 1953, prior to this admission to Fitzsimons Army Hospital. Both of these positive smears were subsequently reported as negative on culture. A great number of subsequent sputum and gastric cultures were all reported as negative.

On 14 November 1955, following five months of streptomycin-INH therapy, a diagnostic right thoracotomy with a decortication was done. The pathologic findings were those of chronic fibrous pleuritis. No evidence of granuloma was found, and all bacteriologic studies were negative. Despite the pathology report the patient was still considered to have tuberculous pleural effusion and was continued on chemotherapy to the time of discharge, with a diagnosis of inactive pleural effusion, on 26 November 1956.

Review of pathologic slides as "unknown" during current study also resulted in a diagnosis of chronic fibrous pleuritis, definitely not tuberculous.

Comment: This case has been classified as tuberculous because of the final clinical diagnosis. However, on careful review of this case we believe there is considerable doubt as to the validity of the diagnosis of tuberculosis.

Two positive sputum smears with negative cultures of the same material would seem to cast doubt on the validity of the positive smear. This is especially true in view of the great number of negative cultures before and since. It seems quite likely that this was a case of nonspecific pleuritis arising on a postpneumonic basis, and probably never was tuberculosis. We would suspect that in this case the pathologic diagnosis was right and the clinical diagnosis was erroneous.

On review of the three cases of clear disagreement, we would conclude that in case 3 the clinical diagnosis rather than the pathologic diagnosis would seem to be in error. In case 2, where the effusion was associated with an acute tuberculous meningitis, it is entirely conceivable that the patient may have had a true cure prior to the time of her surgery. This would leave only case 1, where there was a chronic tuberculous empyema in which we feel the pathology failed to show the expected findings. It is therefore quite likely that the morphologic findings in this series were even more accurate than the 92 per cent claimed for them.

BACTERIOLOGIC FINDINGS ON RESECTED SPECIMENS

Thirty-five of our 38 cases with a final diagnosis of tuberculosis were shown to have had morphologic confirmation on the

basis of material obtained at thoracotomy. Twenty-five of these cases had some form of bacteriologic confirmation, for an incidence of 65.8 per cent. Only one patient had positive tissue sections, smears and cultures of the resected specimen. Twelve patients had positive tissue sections and smears but negative cultures. Seven patients had positive smears only, with negative tissue sections and cultures, and five patients had positive tissue sections with negative smears and cultures. Ten patients (26.4 per cent of our tuberculosis cases) had morphologic findings compatible with tuberculosis but no bacteriologic confirmation of any kind, and three patients (7.8 per cent of the tuberculosis patients) were diagnosed tuberculosis though pathologic or bacteriologic proof was not obtained from the resected specimens. These three cases were described in detail in the preceding section.

THE INFLUENCE OF CHEMOTHERAPY ON THE BACTERIOLOGIC FINDINGS AT SURGERY

Fifty-four of our 63 patients received some form of antituberculous chemotherapy prior to surgery, in courses ranging from two weeks to 26 months. The over-all average duration of chemotherapy prior to surgery in these 54 patients was six and one-half months. Thirty-seven patients received streptomycin-INH. Nine patients received streptomycin-INH-para-aminosalicylic acid (PAS) either as triple therapy or in varying combinations. Five patients received streptomycin and PAS. Two received streptomycin-INH and Terramycin in varying combinations, and one received streptomycin-INH-PAS and Terramycin in varying combinations.

In general, the longer the duration of chemotherapy prior to surgery the less chance there is for bacteriologic confirmation. In individual cases, however, there may be wide variance. In our series, patients were noted to be negative bacteriologically although positive morphologically after as little as two months of preoperative chemotherapy. On the other hand, smears or tissue sections were noted to be positive after as much as 26 months of preoperative therapy.

However, the average duration of chemotherapy in cases having morphologic evidence of tuberculosis without any bacteriologic confirmation was three months longer prior to surgery than in those cases in whom positive smears or tissue sections were obtained.

Chemotherapy of any duration virtually eliminates positive cultures obtained from the resected specimen. The only case in our series with cultural confirmation postoperatively was the single untreated tuberculosis case. The specific drug regimen used does not seem to be important in determining whether bacteriologic confirmation will be found on the resected speci-

men. The important factor is the duration of chemotherapy prior to surgery. It may also be concluded that chemotherapy per se, regardless of duration or drug regimen used, does not seem to alter the morphologic features significantly, so that a presumptive diagnosis on the basis of histopathology is possible in nearly all cases despite chemotherapy.

TABLE 6. *Influence of chemotherapy on histopathologic and bacteriologic findings in 38 patients with discharge diagnosis of tuberculous pleuritis (with or without associated pulmonary tuberculosis)*

Group	Number of patients in group	Histopath. (pleura and/or lung	AFB tissue sec. or smear of specimen	AFB cult. resect. specimen	Chemotherapy preoperative (months)			Regimen (number of patients)					
					Min.	Max.	Aver.	None	SM INH	SM PAS INH	SM PAS	SM INH TM	SM-PAS-INH-TM-
I Unconfirmed	3	Negative	Negative	Negative	5	15	10.0	0*	2	1	0	0	0
II Morphologic confirmation only	10	Positive	Negative	Negative	2	26	9.2	0	4	3	1	2	1
III Morphologic AFB smear or section	24	Positive	Positive	Negative	1.5	23	6.2	0	18	3	2	0	0
IV Morphologic culture	1	Positive	Positive	Positive	0	0	0	1	0	0	0	0	0
Totals:	38 100%	35 Pos. 3 Neg. 92.7% Pos.	25 Pos. 13 Neg. 65.8% Pos.	1 Pos. 37 Neg. 2.67% Pos.	1.5	26	6.2	1 2.6%	24 63.2%	7 18.4%	3 7.9%	2 5.3%	1 2.6%

Table 6 summarizes the foregoing conclusions regarding the influence of chemotherapy on the histopathologic and bacteriologic findings in 38 patients with a discharge diagnosis of tuberculous pleuritis.

FOLLOW-UP DATA

The only way we can confirm that the patients given a nontuberculous diagnosis were indeed nontuberculous is by adequate follow-up. All 63 of our patients had had maximal benefit of hospitalization at the time of their discharge. All tuberculous cases were classified as either inactive or arrested at the time of discharge. In 45 cases information was available six months or longer from the date of discharge. Eighteen patients were lost to follow-up, or no information was available six months or longer after discharge.

Table 7 shows the duration of follow-up in years of the 71 per cent of our patients on whom follow-up information is available.

All 45 of our patients with follow-up data available are essentially well. Most are gainfully employed. None is disabled for medical reasons related to his illness. None of the tuberculous patients has relapsed, and none of the patients given tuberculosis clearance has developed evidence of tuberculosis since the time of discharge.

TABLE 7

Years from Fitzsimons Army Hospital discharge	Number of patients
3-3½	4
2½-3	8
2-2½	5
1½-2	11
1-1½	13
½-1	4
Total	45 (71%)

LIMITATIONS AND PLANS FOR FURTHER STUDY

The primary purpose of this study has been to ascertain the reliability of morphologic findings from tissue obtained at thoracotomy in differentiating tuberculous from nontuberculous effusions.

While it appears to us that this seems to be a reliable method in the vast majority of cases, we are well aware that certain criticisms can be leveled at a retrospective study of this type.

First, our series of 63 cases with relatively short-term follow-up might be considered to be too small and too premature to be of much statistical significance.

Second, only eight of the 25 nontuberculous patients received no chemotherapy prior to or following surgery. In the remaining 17 nontuberculous cases the average duration of chemotherapy approximated six months. It is possible that erroneous tuberculosis clearance might have been given in some of these cases, but that the intensity and duration of chemotherapy were great enough to produce healing and prevent relapse. We are therefore inclined to view this study as a preliminary report which would indicate the validity of our thesis rather than establish its incontrovertible truth.

Bearing these facts in mind, we have set up a protocol for a controlled study in cases of pleural effusion of dubious etiology, eliminating those cases that, on clinical and bacteriologic grounds, are definitely either tuberculous or nontuberculous.

The patients in this study are to be given a short period of preoperative drug coverage, followed by limited thoracotomy with pleural biopsy, such as is advocated by Breckler et al.[3] The tissue obtained is to be separately labeled for examination.

The incision is then to be extended and a full exploratory thoracotomy, with careful palpation of the lung and removal of specimens for examination, is to be carried out. All cases shown to be tuberculous or probably tuberculous on morphologic and/or bacteriologic grounds will receive full courses of antituberculous therapy.

In all cases in whom the bacteriology is negative and the morphology is nontuberculous by the criteria set forth earlier in this paper, all antituberculous drugs are to be immediately discontinued and the patient is to be returned to a full activity status immediately following recovery from surgery. This will include returning military patients to a full-duty status.

All patients will be placed on a regular follow-up schedule and observed at frequent intervals for a period of five years following their surgery. In this manner, if we are wrong no great harm will have been done, since any tuberculous relapses in the supposedly nontuberculous group will come under prompt and adequate medical care. If we are correct in our assumption, there should be a negligible relapse rate in the nontuberculous group.

This study will also give us an opportunity to compare the relative diagnostic accuracy of full exploratory thoracotomy versus limited pleural biopsy procedures in a large number of cases, using each patient as his own control, since both procedures will be carried out by the same surgeon at the same time and examined by the same pathologist using identical technics and diagnostic criteria on both specimens. We would anticipate that full thoracotomy will be confirmed as showing greater reliability than does limited open pleural biopsy.

Should the long-term study bear out the findings indicated in this preliminary report, we feel that we will have added a valuable tool to our diagnostic armamentarium which, when wisely used under proper circumstances, could result in considerable saving in time, family hardship and expense in many instances.

While we are embarking on the study outlined above, it should be emphasized that we are not advocating indiscriminate use of exploratory thoracotomy in all cases of pleural effusion, but are reserving this recommendation for those cases in whom there is some legitimate doubt as to the diagnosis and in whom it is felt necessary to avoid prolonged hospitalization or chemotherapy if it can be reasonably demonstrated that the patient probably does not have tuberculosis.

SUMMARY

1. In an effort to establish better criteria for the differential diagnosis of pleural effusion, the records of 63 cases with pleural disease who received open thoracotomy have been reviewed.

In all of these cases a diagnosis of tuberculosis either was established or was a strong differential diagnostic possibility. All patients received an open thoracotomy for either diagnostic or therapeutic indications, or both. Thirty-eight patients were given a final diagnosis of tuberculosis, and 25 were given a final diagnosis of nontuberculous pleuritis.

2. The tuberculin tests show positive in all patients with the final diagnosis of tuberculosis. All negative tuberculins were in the nontuberculous group. It is felt that a negative tuberculin test, done with properly prepared solutions and repeated six to eight weeks after the onset of the effusion, effectively excludes tuberculosis as the cause of a given pleural effusion. However, positive tuberculin tests prove nothing as far as establishment of a tuberculosis diagnosis is concerned other than the fact that tuberculosis must be considered as a possibility.

3. Other skin tests, such as histoplasmin or coccidioidin, may add to the differential diagnostic possibilities but prove or disprove nothing in the individual case.

4. The pleural fluid showed no consistent physical, chemical or morphologic differences that could be relied upon to differentiate tuberculous from nontuberculous effusions. Only 21 per cent of the patients with a final diagnosis of tuberculosis had positive bacteriologic findings on the pleural fluid aspirate. Bacteriologic diagnosis on pleural fluid is therefore helpful only in a positive way, but negative findings do not exclude tuberculosis.

5. Positive sputum and/or gastric aspirates were found at least once in about 40 per cent of our tuberculous patients. Frequently, one or more positives were found in patients having pleural effusions with no x-ray evidence of parenchymal disease. Nonetheless, the incidence of positive sputum or gastric findings is too low to be of differential diagnostic value in the negative sense. However, positive bacteriologic findings, even in what appears to be "pure" pleural effusion, are probably an indication of underlying active parenchymal or endobronchial disease.

6. Full open exploratory thoracotomy in doubtful cases seems to be more valuable than does limited thoracotomy or closed biopsy technics. Not only can better areas be selected under direct vision for biopsy, but also significant pulmonary lesions are frequently found which otherwise might be undetected.

Nine of the 25 nontuberculous cases had significant pathologic findings other than pleural, either established or confirmed on the basis of thoracotomy which might otherwise have been overlooked. In 10 of the 38 tuberculous cases significant nonpleural

tuberculosis was found which was unsuspected either clinically or by x-ray.

7. Morphologic pleural changes established the presumptive diagnosis of tuberculosis in 32 of 38 cases. In three additional cases the diagnosis was established by the morphology of lesions discovered in the lung at the time of surgery. Thus, morphologic changes in the pleura and/or the lung established a diagnosis in 35 of 38 cases. The additional three cases would never have been diagnosed had not full open thoracotomy with careful palpation of the lung been done. More limited procedures might well have overlooked these cases.

8. The three cases of disagreement between morphologic findings and final diagnoses are analyzed in detail, and it appears that in only one of these three is there no reasonable explanation for the disparity.

9. Morphologic findings on the basis of tissue obtained at open thoracotomy are therefore at least 92 per cent reliable in the present series in differentiating tuberculous from nontuberculous pleural effusions.

10. Morphologic findings are unaffected even by prolonged preoperative chemotherapy in practically all cases.

11. Bacteriologic confirmation of morphologic findings by acid-fast stains of tissue section, smears, or cultures on resected specimens was found possible in 65.8 per cent of the tuberculous patients. In only one patient, however, was it possible to get cultural confirmation.

12. The chance of bacteriologic confirmation of the resected specimen is inversely proportional to the duration of preoperative chemotherapy. The specific drug regimens used do not seem to be important.

13. Follow-up information of from six months to three and one-half years after discharge is available in 71 per cent of our cases. There has been no tuberculosis relapse, and no patient cleared as nontuberculous pleurisy has broken down with clinical tuberculosis to date.

14. The limitations of this retrospective study are discussed, and plans for future study and follow-up of a series of patients are outlined.

CONCLUSIONS

1. In cases of idiopathic pleural effusion it would appear that the best way to make an etiologic differential diagnosis of tuberculous versus nontuberculous origin is by means of an open exploratory thoracotomy, with removal of an adequate area for biopsy from the involved pleura. A specimen of lung should be obtained when pulmonary involvement is found.

2. Morphologic and bacteriologic studies should be done on the resected specimen and should be of differential diagnostic value in almost all cases.

3. Morphologic change is unaffected by preoperative chemotherapy, but the chances of bacteriologic confirmation are inversely proportional to the duration of preoperative chemotherapy.

4. Results of this retrospective study on 63 cases would indicate at least 92 per cent reliability of full exploratory thoracotomy in establishing a differential diagnosis of tuberculous versus nontuberculous pleural effusions on morphologic criteria.

5. There seems to be a strong indication for a controlled study utilizing exploratory thoracotomy in effusions of dubious etiology. Except for a short period of preoperative drug coverage in all cases, antituberculous chemotherapy should be withheld in all patients who do not exhibit morphologic or bacteriologic changes compatible with tuberculosis. A long-term follow-up study on such a series of cases would seem to be of great value.

6. A five-year follow-up study, as indicated above, is currently being established at Fitzsimons Army Hospital, and it is to be hoped that other institutions will do likewise.

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TENSION

Tension is not a severe illness, and those who suffer from tension are well enough to feel and suffer from the cramping self-centeredness imposed upon them by their psychosomatic disorder. They are like those lost souls whose punishment is, in the words of the great Catholic poet, Gerald Manley Hopkins, "to be their sweating selves, but worse."—Aldous Huxley: The History of Tension (editorial). *The New Physician*, May 1959.

AVERAGE LENGTH OF PATIENT STAY IN DEPARTMENT OF DEFENSE HOSPITALS

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Report of Task Group

During recent years as operating costs and demand for medical services have increased, there has been a growing interest in management of hospitals. One of the management tools used, as an index of efficiency of hospital operation and for planning medical service needs, is "length of patient stay data." These data are and have been applied to establish budgets, to determine staffing, and even to influence size and configuration of hospital construction projects.

The Department of Defense hospital system, operated as a part of a world-wide medical service system, consists of several types of hospitals serving different population groups under widely different environmental conditions. It was obvious, therefore, that "average length of patient stay data" collected from such a variety of sources would have limited validity in reflecting efficiency of medical service management. Within the Department of Defense, therefore, "average length of patient stay data" have not been accepted as a useful and reliable management tool.

In general, however, this "mistrust" of such data as an over-all management tool was based on intuition. No critical analyses had been made from the Department of Defense viewpoint. In the meantime, "average length of patient stay data" were being used more and more frequently outside the Department of Defense to compare military and other hospital systems, and to compare one military medical department with another for over-all management.

On 22 December 1958, we established a task group to make an intensive study of "average length of patient stay data," stressing methods of computations and use of such data. I have approved the report of this task group published here. The facts and wording contained in this study will be the basis for use of patient stay data within the Department of Defense.

From the Office of the Assistant Secretary of Defense (Health and Medical). The authors are members of a task group appointed to study this problem.

It is long-standing policy to practice joint use of all medical facilities and services for maximum efficiency and economy of military medical operations. In implementation of this policy, as applied to hospital operations, maximum reliance is placed on officials having direct operational responsibility. In the final analysis, this is the hospital commander. He alone can take the necessary practical steps to reduce the length of patient stay to the minimum consistent with both professional judgment and the principles of good management. Accordingly, the Department of Defense hospital management objectives relating to patient stay are achieved through constant application of our basic policy of efficiency and economy down through the chain of operational command.—Frank B. Berry, M. D., Assistant Secretary of Defense (Health and Medical)

THE concept of average length of patient stay is deceptively simple. In general, average length of stay is computed by dividing the total number of days a group of patients spent in hospital by the number of patients in the group. The arithmetic is easy but the proper interpretation and application is much more complex. As Fineberg[1] recently stated:

> The average length of stay is a very simple figure to obtain. But what does it mean once it is calculated?
>
> In a general hospital, for example, if a tonsillectomy case which stays 5 days and a tuberculosis case which stays 5 months are averaged, the resultant average length of stay is approximately 73 days—a figure which means absolutely nothing.
>
> It is like averaging the weight of a man who weighs 180 pounds, his wife who weighs 110 pounds and their child who weighs 70 pounds. Their average weight is 120 pounds but this figure does not indicate that the man may be overweight, his wife underweight and the child approximately normal in weight. In the same way, the 73-day average length of patient stay in the example above does not indicate whether 5 days is too long a stay for the tonsillectomy or 5 months too short a stay for the patient with tuberculosis.
>
> Neither should a gross average length of stay figure for one hospital be compared with that of another, since this figure can easily be shifted in one direction or another by the number of short or long stay cases included. All the factors involved must be carefully considered and properly weighted before the average length of stay in a given hospital can be properly evaluated.

Much of the misuse and misunderstanding of length of stay information stems from two widely current cause-and-effect stereotypes. First, if treatment is inefficient and dilatory and if there is procrastination in taking the necessary administrative actions with respect to the processing and disposition of patients, the length of stay will be longer than would otherwise

be the case. Second, if actions are taken which result in thorough, prompt and effective treatment and in rapid and efficient accomplishment of administrative requirements, the length of stay will be lessened. Both of these ideas are valid as far as they go, and to the extent that they are applicable. It is not always realized that although true, they are not necessarily relevant to the particular situation under consideration. All too often if length of stay goes up, the first of these stereotypes is assumed to apply and if length of stay goes down, a similar assumption is made about the second. Thus, it has been erroneously assumed that the average length of patient stay can be used as a measure of the efficiency and economy with which a hospital or a system of hospitals is administered—that an increasing average length of patient stay is an indicator of lessened efficiency in operation and that, conversely, a decreasing length of stay is an indicator of improved efficiency in hospital operation.

FACTORS AFFECTING LENGTH OF PATIENT STAY

In point of fact there is a host of other factors which are equally or more likely to have been involved in an increased or lowered length of stay. Let us consider first the effect of an epidemic or very high seasonal incidence of acute respiratory diseases. This can result in a marked overcrowding of the hospital, overworking of the staff, wasteful use of equipment and supplies and lessened efficiency in many phases of the hospital's operation. Nevertheless, as a result of this inclusion of a much higher than usual proportion of short-term respiratory cases in the hospital's patient population, the net effect on the computed average length of stay will almost certainly be a marked reduction. On the other hand, a department or medical service may, in attempting to provide a high standard of medical care and hospitalization with the greatest possible economy, adopt a policy requiring that every effort be made to treat patients with the relatively milder diseases or injuries on an outpatient basis without admission to hospital, where this is medically feasible. Although this policy will result in a saving of hospital beds and hospital costs, it will, if other factors remain constant, increase the average length of patient stay. Consider the following hypothetical example: If a group of 300 hospital patients consisted of 100 patients with 50 days duration each, 100 with 20 days each, and 100 with 2 days each, the total number of days lost by these patients will be 5,000 plus 2,000 plus 200 or 7,200. The average length of stay for this group will be 24 days. Let us suppose that such a change in policy results in treating 80 of the 100 patients who were hospitalized for two days on an outpatient or quarters basis. There will now be only 220 hospitalized patients in the group and they will have lost 7,040 days because the 20 patients remaining in the two-day group will have lost only 40 days. The average duration then for this group of 220 patients would be 32 days per patient. Thus,

a policy which actually reduces the requirement for hospital beds for a given population can result in an increase in the computed average length of patient stay.

A great many factors, other than efficiency of operation, have a marked and definite effect on what the magnitude of the computed average length of patient stay will be. Among those which are readily and easily identified are: departmental and medical service organization and policies, mission of individual hospitals, diagnoses and conditions treated, characteristics of population served, composition of patient load, and proportion of nonmilitary patients. Observations regarding each of these factors follow:

Medical service organization and its policies, both professional and administrative, are important factors in the magnitude of the indexes computed for average length of patient stay. To the extent that these differ from department to department, the validity of interdepartmental comparisons will be affected. For example, the fact that a significant proportion of naval strength is aboard ship and receives medical care in sick bay undoubtedly results in there being a lower proportion of short-term hospital cases than would be the case if the entire force were shore-based. The presumed effect of this would be to produce a higher average length of patient stay vis-à-vis Army or Air Force. Also, the Army and Air Force practice of counting as admissions all patients excused from duty, as of midnight on the day of first excusal, in contrast to the Navy's "binnacle list" system should result in a higher proportion of 1-day short-term cases being included in the Army and Air Force experience with a resultant shortening of average length of stay in comparison with Navy. In many cases these various factors work in opposing directions. Professional policies, whether across the board or on a "by area" or "by echelon" basis, also exert their influence. This relates to such matters as prescription or recommendation of conservative or radical treatment for pilonidal cyst or sinus and for gastric and duodenal ulcer. Administrative policies regarding such questions as steps necessary to obtain orders effecting reassignment of patients ready for return to duty are also relevant. Thus, it can be seen that in the absence of standard organization and policies or of assurance that existing differences are of no effect in this area, interdepartmental comparisons are very risky at best.

Difficulties are also encountered in attempting to compare the length of stay index of one hospital with that of another. The mission of the hospital is, of course, of prime importance. Even if one confines consideration to what might appear as homogeneous hospital categories, major problems still remain. One might assume, for example, that Army Class II hospitals should be comparable in this regard. This, however, is not the case. By the time one has further differentiated on the basis of such points as troop population served for primary care, types of specialized

treatment and proportion of beds authorized for each, and relative numbers of evacuee patients, it is found that the number of importantly differing groups is about the same as the number of hospitals.

It might be thought, *a priori,* that a comparison of average lengths of patient stay on a "by diagnosis" basis would be a simple, straightforward process raising no comparability questions. Indeed, this is about the safest basis on which such comparisons can be made. Even here, though, there are questions. Apart from the general consideration of the age and sex distribution of the patients in the compared groups there is the matter of the complicated and more difficult cases of a particular condition tending to be transferred to the specialized treatment hospitals or centers for care. Proper allowance must be made for this. Also, technical differences exist in the manner of charging and tabulating days lost on a "by diagnosis" basis among the military departments. Whereas in the Army processing the total days lost in the episode of treatment are shown both for sole and for multiple diagnosis cases of the condition involved, in the parallel Navy operation the patient is carried under only one diagnosis at a time insofar as chargeable days are concerned, a selection being made as to the most significant of multiple intercurrent conditions. Also, the proportion that each diagnosis contributes to a given patient load will importantly affect the computed length of stay.

The population served by a military hospital, its characteristics in terms of length of service and age distribution, will have a pronounced effect on the average length of patient stay. A hospital serving a population of recruits or unseasoned personnel is likely to have a relatively low patient stay index because of the comparatively high incidence of acute respiratory disease and the acute childhood-type communicable diseases likely to be encountered. The average length of stay for all patients treated in the hospital will be much affected by the proportion of nonmilitary patients included in the total load. A high proportion of dependents, for example, with large numbers of obstetric cases and tonsillectomies will tend to produce lowered indexes of length of stay.

INTERPRETATION AND USE OF COMPUTATIONS

The proper interpretation and use of computations of average length of patient stay is very complex. The use of a standard formula for derivation of this index would provide no assurance whatever that the indexes so derived were in any way truly comparable. Lengths of stay may be properly computed on a number of different bases depending on the purpose for which the index is to be used. For example, it may pertain to the total period of hospitalization, that is, to the time elapsing between the date of admission and the date of final disposition of the patient. It may relate only to the period between these dates during which

the patient was occupying a hospital bed. It may relate only to that portion of the duration of stay of a transferred case which was spent in one of the hospitals in the evacuation chain or it may relate to the days spent in a specified segment of the hospital system as, for example, in the Army Class II hospitals.

The average length of patient stay may be computed in several different ways which depend, in part, on the nature of the source data upon which the computation is based. For example, it may be derived from individual patient records or from summary statistical reports. In the former case, it may be computed on the basis of the days lost by patients of whom disposition is made within a specified time period, for example, patients disposed of in calendar year 1958, or it may be based on information pertaining to patients admitted in a given time period followed through to ultimate disposition as might be the case where the purpose was to study the effect on duration of a new type of therapy instituted during the period in question. If derived from summary report data, it may be accomplished in several different ways with a greater or lesser degree of detail and precision, depending on the purpose for which it is to be used. In the light of these factors, it is believed that it would be undesirable to attempt to establish or prescribe any single method of computation of duration of patient stay. Requests for information of this kind should be explicit as to the purpose and type of duration information required so that data prepared in compliance with such requests is derived in a similar and comparable manner. The instances in which general information on duration of stay may properly be used are so infrequent that any action which tended to encourage such use would probably be more harmful than helpful.

Data on average length of patient stay have certain specific appropriate uses. For example, in operational planning, where one starts with assumptions as to strengths or population served and admission rates, it is necessary to use length of stay data to develop estimates of bed requirements. Also, when policy changes are instituted regarding matters which directly affect duration of stay, subsequent experience on average length of patient stay will be monitored to ensure that changes observed in the index are compatible with the proper implementation of the changed policy. Examples of such policy changes are: modification of the processing of physical evaluation board cases, marked restrictions in the use of certain types of radical therapy, and major changes in the evaluation policy between treatment echelons. In this specialized situation, deviations will provide a clue to areas requiring further investigation.

METHODS OF COMPUTING AVERAGE STAY

The basic method of computing the average length of stay of hospitalized patients consists of collecting information on a

sizable number of patients and, after final disposition of all these cases has been accomplished, totaling the actual number of days lost by these patients and dividing this aggregate number of days by the number of patients involved. This quotient is the average duration of hospitalization of the group of patients studied. Sometimes this is done with a group of cases that represent all of the dispositions within a particular time period; at other times a cohort of cases (for example, admissions in a particular year) may be followed through until final disposition. In either case, the computation cannot be made until some considerable time after the period when the operating conditions, which governed at least a part of the duration, were in effect. This basic method of computation requires the use of individual medical records.

Another method of computation which permits information on average length of stay to be made available on a current basis makes use of data reported on medical statistical summary reports. Although summary report data do not permit one to follow patients admitted in a particular period through to final disposition, they do provide the basis for a reasonably good estimate of the average length of stay of patients for the particular period.

The summary report method of computation relates the days lost in the period of observation to a derived number of patients assumed to have lost those days and whose average duration is assumed to be representative of the period studied.

Some of the days lost, however, are lost by patients admitted before the beginning of the period under study who are carried on the report for the period immediately preceding the period under study as "on the patient census," "occupying beds," or both. Also, as of the close of the period under study, final disposition will not have been accomplished for all of the patients admitted during the period; consequently some patients will be carried as in the patient census or occupying beds, or both, at the end of the period under study. In order to take account of this situation, it is necessary to make an adjustment in the number of admissions during the period.

To determine the required adjustment to the number of admissions during a given period of time, one must make three basic assumptions.

Assumption 1: Except for magnitude, the separate groups of patients either "on the census" or "occupying beds" at the beginning and at the end of the period are alike, within their respective groups, in regard to everything which affects days lost. This amounts to saying that each patient who was remaining at the beginning of the period and who is matched by a patient admitted in and remaining at the end of the period can be disregarded because the number of days which he contributed to the observed days lost will be offset by a corresponding

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number of days yet to be lost. This also applies to patients occupying beds.

Assumption 2: The eventual total average duration of stay per patient of those patients "on the census" or the eventual total duration in a bed-occupying status per patient of those patients "occupying beds" at the beginning and end of the period will be essentially the same as the average hospital stay of those patients who have been admitted during the period.

Assumption 3: As of any given time, the patients still on the census or occupying beds will, on the average, have completed one half of their total eventual hospitalization. This amounts to saying that, for a given patient census, among those which will eventually have a total hospitalization of, say, 12 days, there will be as many patients who have already completed 11 days as there are patients who have only completed 1 day, and so on.

Given these three assumptions, the admissions figure should be adjusted by adding to it one half of the difference (with regard to sign) between the number of patients on the census at the beginning and at the end of the period (or between the number of patients occupying beds at the beginning and at the end of the period). The necessary computation can be made using the following formulas:

$$\text{Average length of stay, (including authorized absences)} = \frac{T}{A + \frac{C_1 - C_2}{2}}$$

$$\text{Average length of stay in bed-occupying status} = \frac{B}{A + \frac{O_1 - O_2}{2}}$$

Where:

- T = Total days lost in period
- B = Days lost in bed-occupying status
- A = Admissions in period
- C_1 = Census at beginning
- C_2 = Census at end
- O_1 = Occupying beds at beginning
- O_2 = Occupying beds at end

The accuracy of estimates of average length of stay based on summary report data depends on the validity of the underlying assumptions. Frequently, estimates of average duration of stay, based on summary report data, will approximate very closely the average duration figure computed from cases actually disposed of in the period under consideration. In other instances, the average durations computed from summary data will differ from averages based on cases disposed of, with the difference being

only a reflection of an actual change in the hospital duration picture that is in the process of developing—a change which will result in a different average duration for cases disposed of at some future date, as compared with cases disposed of in the in the period studied. Occasionally, in other instances average durations derived from summary report data may be different from those which could be computed from a group of cases disposed of during the same period or during a later period, with the difference being an artifact of the data and of the method of computation. This might happen if the assumptions on which the method is based do not hold for the particular period.

Anything which invalidates the basic assumptions will affect the average lengths of stay obtained. How much it affects them will depend on the extent to which the assumptions are rendered invalid, the relative magnitude of the patient populations at the beginning and end of the period, and the length of the period observed. In most situations, the assumptions are completely defensible but there are very many circumstances which may render them invalid. Consequently, the application of this method to a particular problem must always be with careful consideration of the specific set of circumstances involved and with full understanding of the implications of the stated assumptions.

Although the basic methods of computation described above are generally applicable, there are many specialized applications of them which are properly made for specific purposes. Some of the principal indexes frequently computed are listed below:

1. Average total length of patient stay in excused-from-duty status (hospital and quarters).
2. Average total length of patient stay in hospital (including leave, temporary duty, et cetera).
3. Average length of patient stay in an occupying bed status.
4. Average length of patient stay per separate hospital episode (including transfers as cases).
5. Average length of patient stay in hospitals in the United States for cases originating in the United States.
6. Average length of patient stay in hospitals in the United States for evacuee patients.
7. Average length of patient stay in specialized treatment hospitals.
8. Average length of patient stay in hospitals of own department.
9. Average length of patient stay in nonspecialized hospitals.
10. Average length of patient stay for all patients admitted for specified diagnosis.
11. Average length of patient stay for all patients admitted for specified diagnosis where this is sole diagnosis.
12. Average length of patient stay for patients returned to duty.
13. Average length of patient stay for patients separated for disability—total or by specified type of separation.
14. Average length of patient stay for patients who died.

A full list would be several times this length inasmuch as many of the types specified may be cross-classified by other types. For example, almost all of them may be computed on a "days on census" or "days of bed occupancy" basis. Many of them may be computed on a "world-wide," "United States," or "overseas" basis. Many of them may be computed on an "all patients," "all military patients," "patients of specified military departments," "nonmilitary," or "specific type of nonmilitary patient" basis. Each of them may be on an "all causes," a "battle casualties" only, or a "non-battle causes" basis in time of war. Each different type of length of patient stay index requires either a special variant of the general length of stay formula or a special instruction for the source of the elements included in the formula. The use of variants specifically tailored to the purpose at hand should be encouraged. It should, of course, be understood that the different types of indexes will vary widely in magnitude. For example, in 1958, for Army patients treated in hospitals in the United States, the average number of total hospital days per patient was 50 for those treated in TSG Command Hospitals (Class II), 11 for those treated in Army Command Hospitals (Class I), 30 for those treated in Air Force and naval hospitals, and 20 for all military hospitals.

COMPARISON WITH CIVILIAN HOSPITAL EXPERIENCE

Duration of stay in military hospitals cannot properly be compared to data on length of stay in civilian hospitals. There are very real and very important differences between hospitalization in the military and civilian situations. Contagious diseases occurring among military personnel require isolation (and therefore hospitalization) in order to prevent further transmission of the disease. In civilian life many of these patients can be treated at home. Inasmuch as the housing of military personnel is usually under barracks or field conditions, hospitalization is often indicated for the protection and well-being of the patient as a substitute for the home care not available to most military personnel. In civilian life, even for those cases hospitalized, the period of hospitalization is generally limited to the middle period of most acute illnesses, and is preceded by a period of prehospitalization care and followed by a period of posthospitalization care at home, neither of which is included in the duration of stay in civilian hospitals. The conditions of military life (barracks, quarters, et cetera) are such that patients must be retained in the hospital who could, as civilians, be returned from the hospital to their home for a period of convalescence prior to actual return to full activity.

SUMMARY AND CONCLUSIONS

The basic method of computation of average length of patient stay, that is, the division of an aggregate of patient days by the number of patients losing those days, is universally under-

stood and accepted and no formal standardization action is believed to be necessary.

Beyond this, the number of valid and useful kinds of specific measures of length of patient stay is so large and of such variety that standardization is not considered feasible or desirable. Official standardization of a limited number of those indexes might tend to give these particular measures a special status which would lead to their being used in situations where a different index would be more appropriate and useful for the purpose.

General purpose use of indexes of length of patient stay should be discouraged because of the rarity of occasions on which such use is justified. The use of measures of the average length of patient stay on either a current comparison or trend basis as an index of efficiency of hospital operations is fallacious and should be condemned. Specific and *ad hoc* use of indexes of length of stay suitable to the purpose and circumstances of their application should be encouraged.

Requests for information relative to average length of patient stay should be sufficiently explicit as to reason and intended use to permit selection of the type of patient stay index most appropriate and informative for the purpose. Data provided or published on average length of patient stay should be labeled and described in sufficient detail to permit proper informed use and evaluation.

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PREPARATION FOR SURVIVAL

With our modern weapons of unprecedented destructive power which give offense the predominant role, we must realize that in unlimited thermonuclear war decisive blows will be struck at the very outset. Within a few moments of this occurrence the medical profession will be called into action. If we are unprepared, our accomplishments will be dispersed, uncoordinated, and too often futile. If we are prepared with good programs, good planning, and good organization, much may be accomplished even in the areas of devastating destruction, and our means to protect human resources and rehabilitate our population will be greatly enhanced. The surviving population is the most valuable asset in any economically developed country. —Frank B. Berry: Mass Casualty Planning and Management, *North Carolina Medical Journal,* October 1958.

"Pyometra" in a Male Pseudohermaphrodite

EDWIN L. ADAIR, *Captain, MC, USA*
EVAN L. LEWIS, *Lieutenant Colonel, MC, USA*

A CASE of pyometra in a male pseudohermaphrodite is presented because it is extremely unusual and appears significantly different from other cases in the literature. Male pseudohermaphrodites generally present themselves for correction of hypospadias or cryptorchism. Rarely do they have complications from persistence of Müllerian duct remnants. This is attested to by the fact that many male pseudohermaphrodites reach middle age before the condition is recognized and have no history of genitourinary symptoms even though they may have a complete internal female genital tract. In a review of the recent literature only four instances of Müllerian duct remnants causing lower urinary tract symptoms could be found.[1,2,3,4]

CASE REPORT

A 36-year-old man was seen for evaluation of "chronic prostatitis" which had been present for nine years. His only complaint was a persistent discharge of about 30 ml of greenish-yellow pus from the urethra which occurred one to three minutes following micturition. He had no pain or burning on urination and denied having fever, chills, frequency, or urgency. On all previous hospitalizations he had been treated with prostate massage, sitz baths, and antibiotics with temporary stoppage of the urethral discharge.

Past history revealed that the patient had been on active duty for 16 years. On two separate occasions he had been operated on for undescended testes through routine herniorrhaphy incisions. On each occasion the patient was told that no testes could be found. He had had the usual childhood diseases and one hospitalization for pneumonia. The patient was married and had normal sexual relations with his wife including orgasm and ejaculation, but had no children. He was investigated five years previously for infertility and was told that he had azoospermia. His mother, father, and six siblings were all living and well and, to the patient's knowledge, had no genito-

From Letterman Army Hospital, San Francisco, Calif.

urinary tract anomalies. The patient had a progressive weight loss during the five years preceding admission, totaling 35 pounds.

Physical examination revealed a well-developed, chronically ill appearing individual who had a male body build. He had a coarse

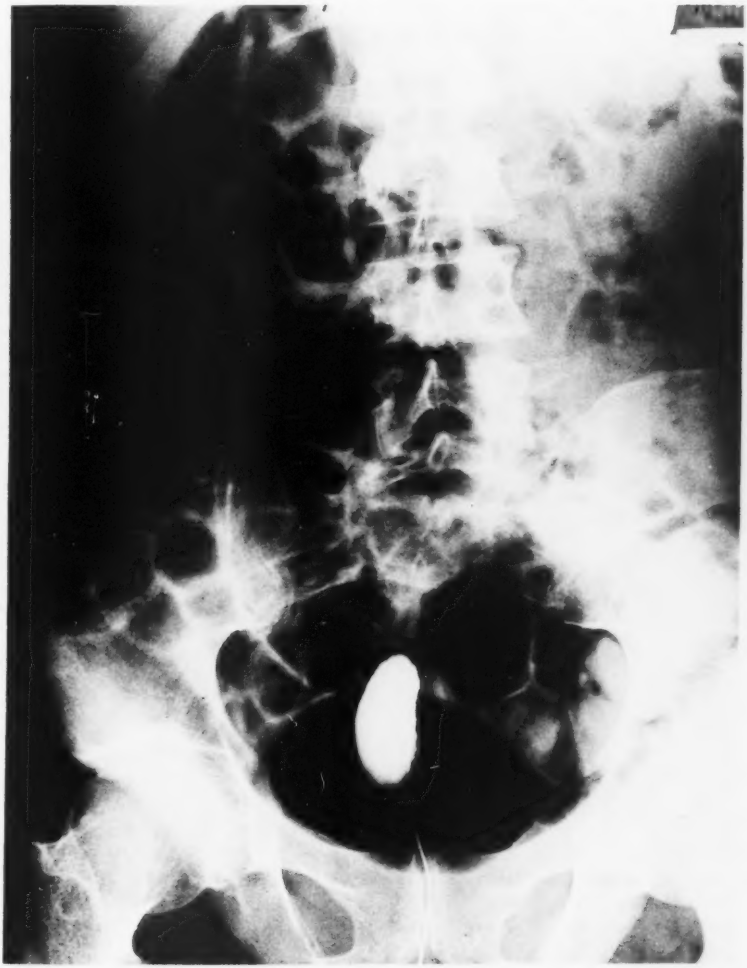

Figure 1. Pneumocystogram with contrast media filling Müllerian duct remnant.

beard requiring him to shave daily, but body hair was scanty. There was a normal male escutcheon. The only other significant findings included bilateral inguinal "herniorrhaphy" scars; poorly-developed, nonbifid scrotum; hypospadias of the glandular type; and a small pi-

lonidal sinus. A thorough search was made for undescended or ectopic testes and none could be found. The phallus was well developed. The prostate was small, firm, and nontender, and no other masses could be palpated rectally.

Figure 2. Surgical specimen showing relationship of the paired ducts to cervix and uterus. Note the vas deferens, which subsequently was found to end blindly. The right testis may have been removed during previous exploration of right inguinal canal.

The leukocyte count was 8,400 per μl with a normal differential. *Escherichia coli* was cultured from the urine and found to be sensitive to chloramphenicol. Urinary 17-ketosteroids were 11.6 mg/24 hours. A cystourethrogram and intravenous pyelograms were normal. Cystoscopy disclosed a slight lateral and upward displacement of the right ureteral orifice. Examination of the posterior urethra revealed that the vesical neck and prostatic urethra were covered with a shaggy gray membrane. The colliculus seminalis was poorly developed and there was a "double-barrel" opening in the area of the prostatic utricle. Manual pressure in the rectum caused a flow of pus from both of these openings but no mass or tubular structure could be felt rectally above the prostate. A No. 3 French ureteral catheter was passed 10 cm into the right opening. The bladder was filled with air and 40 ml of Lipiodol was injected through the catheter. Roentgenograms were

taken (fig. 1). The openings of the ejaculatory ducts could not be found. Biopsy of the buccal mucosa revealed a male chromosome pattern.

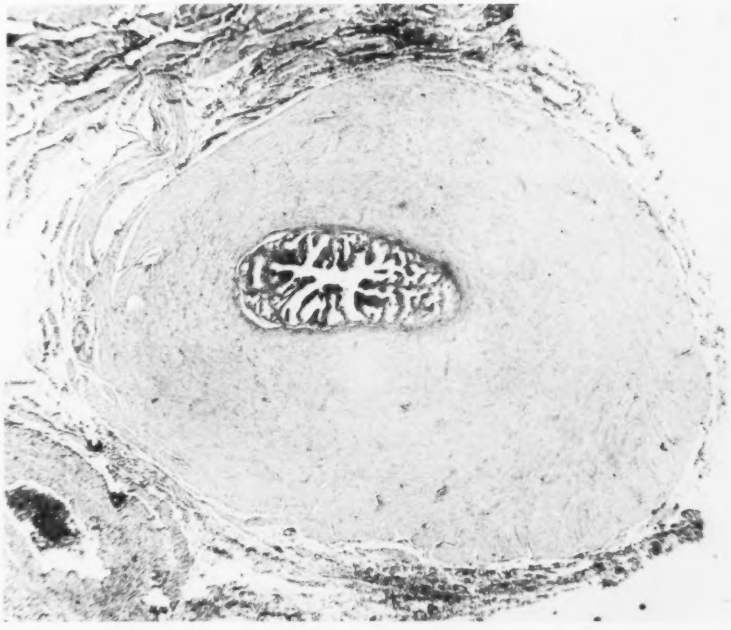

Figure 3. Sections of the tubular structure attached to the vas deferens.

The patient was told that he had an "abscess behind his bladder" and that the only way to effect a cure of his urethral discharge was to surgically remove or drain this pocket of pus. He readily consented to surgical intervention, and an extraperitoneal approach to the bladder was made through a lower midline abdominal incision. Dissection was carried down the right lateral aspect of the bladder and a large, cystic, thick-walled structure was encountered which was firmly adherent to the bladder, sigmoid colon, and pelvic floor, and contained in excess of 100 ml of creamy yellow pus. This structure was removed (fig. 2). Because of the marked scarring and subacute inflammatory reaction in the surrounding tissues, small openings were made in the peritoneum of the pelvic floor. These were repaired primarily and the area drained through the abdominal incision. No attempt was made at this time to explore the peritoneal cavity for gonads.

The surgical specimen was removed in two portions, the combined length of which was 11 centimeters. The cut surface of the wall appeared to be smooth muscle with an inner epithelial lining. The previously mentioned paired ducts, seen on endoscopic examination,

entered the cyst at its distal end, but communication between these structures was considerably impaired by a narrow, thick-walled segment which resembled a cervix. A tubular structure attached to the cyst proved on microscopic examination to be a vas deferens (fig. 3). Microscopic sections of the cyst wall were typical of uterus. In spite of a long-existent infection, the endometrium was relatively intact and was of an atrophic proliferative type. There was infiltration of chronic inflammatory cells into both the endometrium and myometrium (fig. 4). Two multiloculated cystic structures within the uterine wall were identified microscopically as seminal vesicles (fig. 5).

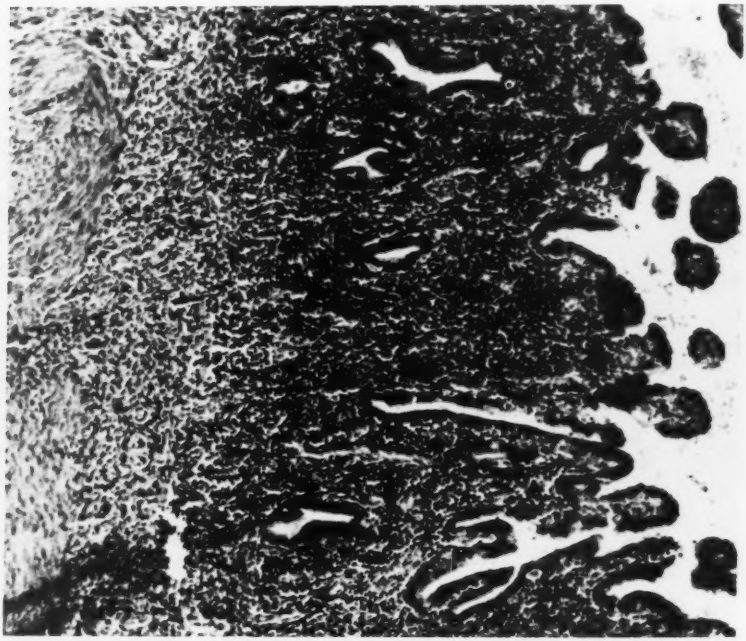

Figure 4. Photomicrograph of a section of uterine wall, showing infiltration of endometrium and myometrium with chronic inflammatory cells.

The patient did well for the first three postoperative days and then developed progressive signs and symptoms of mechanical bowel obstruction. A laparotomy was performed and a segment of terminal ileum was found herniated through the previously repaired defect in the pelvic floor. The defect was again closed and a gangrenous segment of terminal ileum resected. During this procedure a gonad was found on the left wall of the pelvis, attached to a broad ligament and oviduct. The gonad was biopsied. A vas deferens was palpable on the right side, but no testis could be found. Sections of the biopsied left gonad revealed a typical intra-abdominal testis with hyalinized tubules and interstitial cell hyperplasia (fig. 6).

DISCUSSION

Although it has been shown by Sørensen[5] that the occurrence of cryptorchism is forty times more common in hypospadic persons than in the normal population, the statistical relationship of Müllerian duct remnants to hypospadias or cryptorchism apparently has not been determined. No case of a Müllerian duct remnant that was not associated with one or both of these conditions could be found in the literature. Of 15 hypospadic pa-

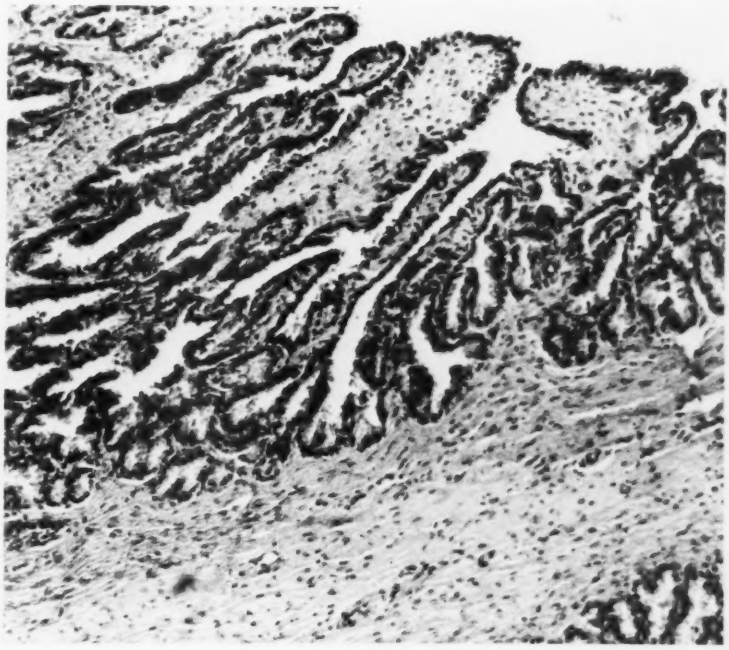

Figure 5. Section of multiloculated cystic structure identified microscopically as seminal vesicle.

tients whom Howard[4] examined endoscopically, two had large Müllerian duct remnants. He found the utricle enlarged in all patients with penoscrotal and perineal hypospadias. No enlargement was found in penile and glandular hypospadias. He believed that the degree of hypospadias was directly proportional to the size of the Müllerian duct remnant. He also concluded that the frequency of occurrence of the two conditions in combination indicated that hypospadias was an intersexual anomaly and not a simple local developmental error. This viewpoint has been given some experimental support by Jost[6] who has shown that almost all intermediate degrees of male genital differentiation

can be produced by castration at various periods of fetal development. Interestingly enough, castration of female fetuses does not alter somatic sexual development. Removal of fetal testes during the course of sexual differentiation produces "normal" female, hypospadic male, or normal male genitalia, depending on the time of castration. Varying degrees of Müllerian duct development in the male embryo can be produced in the same manner and concurrently with hypospadias.

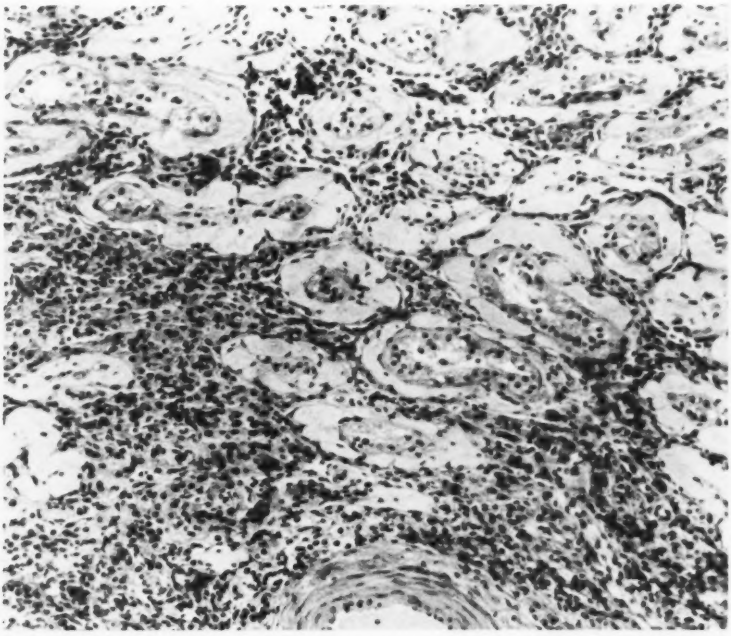

Figure 6. Intra-abdominal testis with hyalinization of tubules and interstitial cell hyperplasia.

It is apparent from this that androgen is needed for male somatic sex development, but that in the absence of hormone stimulation, female somatic sex differentiation progresses in an apparently normal manner. Further proof was offered in that feminization of the external genitalia and atrophy of the wolffian duct system could be prevented in castrated male fetuses by the administration of androgen. Evidently male pseudohermaphrodites are genetic males who lack sufficient androgen at the time of sex differentiation to cause regression of the Müllerian ducts and closure of the urogenital sinus and urethra.

Generally, the communication between a Müllerian duct remnant and the urethra is sufficiently large that no obstruction to drain-

age occurs. This probably accounts for the infrequent occurrence of infection in these structures. In the case presented, the distended bladder evidently caused elongation and narrowing, torsion, angulation or compression of the outlet, or a combination of these factors. Following urination, the duct became patent and partial emptying occurred. This is only conjecture because no such mechanisms were demonstrated during the surgical procedure.

We noted that the roentgenographic dimensions of the cavity were much smaller than the anatomic size. This may have been due to the Lipiodol filling only one of the paired ducts and not passing into the uterus because of the intervening cervix.

SUMMARY

In a male pseudohermaphrodite with pyometra the genitourinary anomalies included a uterus with cervix; glandular hypospadia; bilateral cryptorchism; poorly developed, nonbifid scrotum; and a single, left-sided, intra-abdominal testis. Buccal mucosa biopsy showed this patient was a genetic male. Surgical removal of the Müllerian duct remnant was carried out because of severe chronic infection.

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THE POWER OF WORDS

Good writing about medicine really does not differ very much from good writing about anything else. Good writing is said to have conversational quality but it has something more than that, even in medicine. It appeals not only to the intellect but it touches the emotions as well and can moisten the cheek or lift the lips in smile, or bring friendly glow of understanding to the heart.—Art of Writing. (editorial) *Northwest Medicine,* March 1959.

Acute Posttraumatic Aneurysm of Radial Artery

ERICH A. EVERTS-SUÁREZ, *Captain, MC, USA*

ANEURYSMS of the peripheral arteries are uncommon.[1-4] In general they can be classified into congenital and acquired. Congenital aneurysms are extremely rare. Acquired aneurysms may be divided into those caused by trauma and those which are the result of degenerative disease. Traumatic aneurysms can be subclassified into true and false aneurysms. True aneurysms have arterial muscle elements as an integral part of the wall. False aneurysms have a fibrous capsule forming their wall. Aneurysms also may be classified as traumatic,[5] mycotic[6] or spontaneous[7] in origin. Traumatic aneurysms may be either acute (those developed rapidly following trauma to a vessel) or chronic[8] (those due to repeated or continuous injury to the artery). The patient reported here had an acute posttraumatic aneurysm of the radial artery.

CASE REPORT

A 20-year-old Negro entered Carlisle Barracks hospital because of a pulsating mass on his right forearm. Three months previously he had been stabbed in this arm with a knife. Two weeks after the injury he noticed a swelling beneath the skin, immediately adjacent to the scar. The mass had gradually increased in size.

Physical examination revealed a blood pressure of 130/70 mm Hg, with a pulse rate of 84 per minute. The neck was supple without adenopathy and the thyroid was normal. The lungs were clear. The heart was within normal limits. The abdomen and genitalia were normal. There was a 3- by 3- by 3-cm, soft, pulsating mass over the radial artery at the junction of the middle and distal third on the volar surface of the forearm. A systolic murmur was present over the mass. The radial pulse was only barely felt at the wrist when the radial artery was compressed above the tumor. A good right ulnar pulse was present. No circulatory or neurologic changes were noted distal to the aneurysm. The results of laboratory studies were essentially negative. No radiographic examinations or arteriograms were performed.

From Second U. S. Army Medical Laboratory, Fort George G. Meade, Md. Dr. Everts-Suárez is now at St. Mary's Hospital, Philadelphia, Pa.

Surgical excision was advised and performed. Under general anesthesia a 10-cm incision was made over the tumor and the radial artery. A tourniquet was placed superior to the aneurysm, and a bloodless field was produced. Tapes were placed around the artery above and below the mass and the aneurysm was dissected free from the surrounding structures. The aneurysm was found to arise from the medial side of the radial artery. An end-to-end anastomosis of the radial artery was performed after removing a small segment of the artery containing the aneurysm. The anastomosis was performed using a continuous suture of 6-0 black silk. After determining that the anastomosis was patent, the incision was closed in layers. The postoperative course was uneventful and at the time of discharge the patient had excellent radial pulse distal to the anastomosis.

Figure 1. Bisected aneurysm. Note string extending through proximal and distal sections of artery.

The specimen removed at operation consisted of a mass that measured 2.5 cm in diameter. It was yellowish brown in color. In the lateral side of the mass there was a portion of an artery that measured 1 cm in length by 0.3 cm in diameter. A cotton string had been inserted through the arterial lumen (fig. 1). It communicated freely with the lumen of the aneurysm and opened to the exterior. The aneurysm contained laminated clotted blood in the lumen. The aneurysmal wall measured between 0.1 and 0.2 cm in thickness and was gray brown in color. The aneurysmal sac appeared to form part of the medial wall of the radial artery.

On microscopic examination the wall of the aneurysm consisted of a thick external layer of fibrous connective tissue and an inner layer of vascularized, loose connective tissue, adherent to which were fragments of clotted blood (fig. 2). Moderate amounts of hemosiderin pigment were

Figure 2. Wall of aneurysm consisting of fibrous connective tissue and clotted blood.

present in all layers of the wall. No muscle fibers were present (Masson's stain). The pathologic diagnosis was posttraumatic aneurysm of the radial artery.

COMMENTS

There are very few published reports of aneurysms of the radial artery. Reid[9] found three cases in the files of Johns Hopkins Hospital from the opening of the hospital to 1922. Robb, McKechnie, and Guthrie[5] presented a case in 1942. In 1949, Goadby, McSwiney, and Rob[6] described a mycotic aneurysm of the radial artery in a 46-year-old man.

Aneurysms in this area are best treated surgically. In most cases excision of the aneurysm with proximal and distal ligation of the artery has been performed with good results. Excision of the aneurysm with end-to-end anastomosis of the artery, when feasible, is the procedure of choice.

SUMMARY

Aneurysms of peripheral arteries are uncommon. Those occurring in the radial artery are rare. A case report of a patient with an acute posttraumatic aneurysm of the radial artery is presented.

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ACCEPT NEW DRUGS—SLOWLY

Be slow to accept any new agent. In dealing with new drugs it is particularly important to remember the principle—"First, do no harm." Very few new drugs represent major advances in therapy, and those which do will quickly show their real value. You will do your patients little harm by delaying the acceptance of new agents, and you may save them from dangerous side effects, from unjustified reliance on new drug therapy to the exclusion of more reliable, if less spectacular measures and, if nothing else, from the unnecessary expenditure of considerable sums of money. New drugs are never cheap.—Mark Nickerson and John P. Gemmell: Doctors, Drugs and Drug Promotion, *Canadian Medical Association Journal*, April 1, 1959.

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Officers Certified by Specialty Boards

The surgeons general of the military medical services have announced that the following regular Medical Corps officers have been certified by the specialty boards indicated.

American Board of Anesthesiology

Hathaway, Robert G., Capt., USA

American Board of Dermatology

Watkins, Dale B., Capt., MC, USN

American Board of Internal Medicine

Boyers, James H., Capt., MC, USN
Rosenberger, Eugene A., Maj., USA

Cardiovascular Disease

Lynn, Doss O., Col., USA

Gastroenterology

Boyers, James H., Capt., MC, USN

American Board of Obstetrics and Gynecology

Johnson, Wendell A., Comdr., USN

American Board of Ophthalmology

Brown, William C., Capt., MC, USA
Lansche, Richard K., Capt., MC, USA

American Board of Orthopedic Surgery

Golbranson, Frank L., Comdr., MC, USN
Krepela, Miles C., Capt., MC, USN

American Board of Pediatrics

Ayala, Alfrede, Capt., MC, USA
Ballenger, Claude N., Jr., Capt., MC, USA

American Board of Radiology

Spicher, Robert W., Comdr., MC, USN
Wartella, Stephen, Jr., Maj., USAF (MC)

Nuclear Medicine

Borris, Robert C., Capt., MC, USA
Lewis, Garner L., Comdr., MC, USN
Connolly, John R., Capt., MC, USA

American Board of Surgery

Garrett, Robert I., Lt., MC, USN
Henderson, Warren S. P., Lt. Col., MC, USA
Green, Richard E., Maj., MC, USA
Whatley, Joseph L., Comdr., MC, USN

Thoracic Surgery

Warden, Horace D., Capt., MC, USN

American Board of Urology

Gonder, Maurice J., Maj., MC, USA

NAVY NAMES CAPTAINS ANDREWS, HOLLAND, AND RIGGS FOR PROMOTION TO FLAG RANK

Three senior Navy Medical Corps captains, James L. Holland, Cecil L. Andrews, and Cecil D. Riggs, were recently selected for promotion to flag rank. They will receive their appointments as rear admirals as vacancies occur.

Captain Riggs

Captain Holland

Captain Andrews

Captain Holland, senior medical officer of the staff of the Commander, Naval Air, Pacific, is a 1930 graduate of Vanderbilt University School of Medicine. During World War II he served as a medical officer aboard the U. S. S. *Indianapolis,* and later the U. S. S. *Essex.* He was designated a flight surgeon in 1943, and is a former commanding officer of the U. S. Naval School of Aviation Medicine.

Captain Andrews, commanding officer of the U. S. Naval Hospital, St. Albans, New York, was commissioned in 1930 following his graduation from Indiana University School of Medicine. He was awarded the Purple Heart Medal and the Bronze Star Medal with combat "V" for service as a medical officer aboard the U. S. S. *South Dakota* in 1944. He is a former director of the professional division, Bureau of Medicine and Surgery.

Captain Riggs, commanding officer of the U. S. Naval Hospital, Chelsea, Massachusetts, was awarded the Navy Cross during World War II for outstanding service as a flight surgeon at Pearl Harbor during the Japanese attack. During the Korean conflict, he received a letter of commendation and the Bronze Star Medal for meritorious service. A 1930 graduate of the University of Louisville School of Medicine, Kentucky, he was formerly stationed at the U. S. Naval Hospital, Bethesda, Maryland.

CAPT. SILLIPHANT RETIRES, IS SUCCEEDED BY COL. TOWNSEND; CAPT. FULLER NEW DEPUTY

Captain William M. Silliphant, MC, USN, who was succeeded on 1 August as director of the Armed Forces Institute of Pathology by Colonel Frank M. Townsend, USAF (MC), retired from the Navy this month after more than 29 years of active service. He will join the staff of the Cancer Research Institute and Department of Pathology of the University of California Medical Center in San Francisco.

Captain Silliphant

Captain Fuller

Captain Roger H. Fuller, MC, USN, is the new Navy deputy director of AFIP. A 1938 graduate of Tufts University School of Medicine, he entered the Navy in 1942 and recently served as pathologist at the U. S. Naval Hospital, Camp Pendleton, California. He was certified in pathology in 1949.

Captain Silliphant was commissioned in the Navy in 1930 after his graduation from Stanford University School of Medicine. He was on duty in the Philippine Islands at the outbreak of World War II and was interned by the Japanese for 37 months. In 1947, he became director of laboratories and executive officer at the U. S. Naval Medical School, Bethesda, Maryland. He was appointed Navy deputy director of AFIP in 1952, and became director in 1955.

Colonel Townsend, the first Air Force officer to become director of AFIP, has been deputy director since 1955. A 1938 graduate of Tulane University School of Medicine, he has been a faculty member of Washington University School of Medicine, the University of Nebraska College of Medicine, and the University of Texas Medical Branch. In 1951, he established the first Air Force histopathology center at Lackland Air Force Base, Texas.

1959 MILITARY SURGEONS' MEETING TO FEATURE DOD COLOR TV PRESENTATIONS

Dedicated to the theme "Practice of Military Medicine—Broadening Concepts," the 66th annual meeting of the Association of Military Surgeons of the United States at the Mayflower Hotel, Washington, D. C., 9-11 November 1959, will be highlighted by closed color television programs from various Department of Defense medical research centers, according to an announcement by Major General Harold H. Twitchell, USAF (MC), president of the society.

General Twitchell

The Scientific program of the meeting, arranged by a committee under the chairmanship of Colonel Frank M. Townsend, USAF (MC), director of the Armed Forces Institute of Pathology, will include a group of noted civilian and military physicians. Colonel Aubrey L. Jennings, USAF (MC) is general chairman of the meeting.

The closed color TV program, arranged in cooperation with Smith, Kline & French, will include a presentation of military medical activities at Andrews, Lackland and Patrick Air Force Bases, the new U. S. Air Force School of Aviation Medicine, Brooks Air Force Base, Texas, the Armed Forces Institute of Pathology, and the Aero Medical and Arctic Aeromedical Laboratories. Following is a list of speakers and their subjects:

Monday, 9 November 1959

Band Concert

Opening Ceremonies

Panel of Surgeons General

The Health Horizon—*Austin M. Smith, M. D.*, President, Pharmaceutical Manufacturers Association.

Knowledge of Newer Respiratory Viruses—*Robert M. Chanock, M. D.*, Laboratory of Infectious Diseases, National Institutes of Health, Bethesda, Maryland.

Present and Future Problems in VD Control—*William J. Brown, M. D.*, Chief, VD Branch, Communicable Disease Center, U. S. Public Health Service, Atlanta, Georgia.

The Danger of Folic Acid in Multivitamine Preparations—*Lieutenant Colonel William H. Crosby, MC, USA,* Walter Reed Army Institute of Research, Washington, D. C.

Tuesday, 10 November 1959

Porter Lecture—Trends in Mental Health—*Paul H. Hoch, M. D.,* Commissioner of Mental Hygiene, State of New York.

Current Trends in the Indications for Surgery in Peptic Ulcer—*Raymond W. Postlethwait, M. D.,* Chief, Surgical Service, Veterans Administration Hospital, Durham, North Carolina.

Changing Concepts of Nutrition Following Subtotal Gastrectomy—*John M. Rumball, M. D.,* Director, Medical Service, Department of Medicine and Surgery, Veterans Administration, Washington, D. C.

Closed Circuit Color Television Program—Originating from Andrews Air Force Base, Washington, D. C.

Wednesday, 11 November 1959

The Tissue Bank—*Captain George W. Hyatt, MC, USN,* Director, Tissue Bank Department, U. S. Naval Medical School, National Naval Medical Center, Bethesda, Maryland.

Medical and Surgical Aspects of Open Cardiac Surgery—*Brigadier General Clinton S. Lyter, MC, USA,* Commanding Officer, William Beaumont Army Hospital, El Paso, Texas; and *Major Per H. Langsjoen, MC, USA,* Chief, Cardiovascular Service, William Beaumont Army Hospital.

Selective Malfunctioning of the Human Machine—*Lieutenant Colonel Douglas Lindsey, MC, USA,* Director of Medical Research, U. S. Army Chemical Warfare Laboratories, Army Chemical Center, Maryland.

Three Years Experience with Intensive Treatment and Recovery Unit in Medicine and Surgery—*Captain Lewis L. Haynes, MC, USN,* Chief of Surgery, U. S. Naval Hospital, Chelsea, Massachusetts.

The Use of Radioisotopes in Medical Practice—*Captain Elmer R. King, MC, USN,* Director, Department of Nuclear Medicine, U. S. Naval Hospital, National Naval Medical Center, Bethesda, Maryland.

Use of Fluorescent Antibody Technics in Hospital Practice—*Ralph B. Hogan, M. D.,* Chief, Laboratory Branch, Communicable Disease Center, Department of Health, Education and Welfare, U. S. Public Health Service, Atlanta, Georgia.

Drug Therapy in Hypertension—*Edward D. Fries, M. D.,* Chief, Medical Service, Veterans Administration Hospital, Washington, D. C.

The Use and Abuse of Drugs—*Arthur Grollman, M. D.,* Chairman, Department of Experimental Medicine, Southwestern Medical School, University of Texas, Dallas, Texas.

Closed Circuit Color Television Program—Originating from Andrews Air Force Base, Washington, D. C.

COL. BRAMLITT APPOINTED SECRETARY OF AMA COUNCIL

Colonel Charles H. Bramlitt, USAF (MC), who retired 31 July as deputy director of professional services for the Air Force surgeon general after more than 20 years of military service, has been named to succeed Thomas G. Hull, Ph. D., as secretary of the Council on Scientific Assembly of the American Medical Association.

NEW USAF DEPUTY DENTAL CHIEF

Colonel Maurice C. Harlan, USAF (DC), director of dental services division at Gunter Branch, U. S. Air Force School of Aviation Medicine, Gunter Air Force Base, became deputy assistant for Air Force dental services, on 1 July. He will serve as assistant to Brigadier General James S. Cathroe, USAF (DC).

Colonel Harlan

A 1933 graduate of the State University of Iowa College of Dentistry, Colonel Harlan entered active duty as a reserve dental officer in 1936 after three years of private practice, and received a regular Army commission the same year. During World War II he served at Billings General Hospital, Fort Benjamin Harrison, Indiana, and as dental surgeon of the 199th General Hospital, Camp Ellis, Illinois, accompanying this unit to France. In 1945 he was ordered to Davis-Monthan Air Force Base, Arizona, as chief of dental service.

Following a postgraduate course in periodontia, in 1948, at Tufts Dental College, Colonel Harlan became dental surgeon at Valley Forge General Hospital. The following year he was transferred to the Air Force. From 1950 to 1952 he was dental surgeon of Elmendorf Air Force Base, Alaska, and later command dental surgeon of the Alaskan Air Command. He served as dental surgeon of McChord Air Force Base, Washington, from 1952 to 1955.

DR. SHERMAN NAMED NEW ASSOCIATE EDITOR

Dr. May Sherman, former medical writer for several leading pharmaceutical companies and an editor of the *Atlas of Tumor Pathology*, sponsored by the National Research Council and the Armed Forces Institute of Pathology, has joined the staff of the *U. S. Armed Forces Medical Journal* as associate editor. For the past two years she has been chief of the analysis and reports section of the grants and training branch, National Heart Institute, Bethesda, Maryland. A 1941 graduate of the University of Buffalo School of Medicine, Dr. Sherman holds bachelor's and master's degrees from Brown University. She is a diplomate of the American Board of Pathology and of the National Board of Medical Examiners, a fellow of the College of American Pathologists, and a member of Phi Beta Kappa and Alpha Omega Alpha.

NATIONAL CONSULTANTS. Three national consultants to the Air Force surgeon general are shown with Colonel Levi Browning, USAF (MC), hospital commander at Elmendorf Air Force Base, Alaska, during their tour of treatment facilities in the 49th state during July. Left to right: Colonel Browning; Dr. Edgar J. Poth, professor of surgery, University of Texas Medical Branch, Galveston; Dr. James J. Callahan, consultant in orthopedic surgery, Callahan Clinic, Chicago; and Dr. Edward Stewart Taylor, professor of obstetrics and gynecology, University of Colorado School of Medicine, Denver. During their visits to hospitals, the consultants gave advice on problem cases and conducted lectures and teaching sessions.

BLOOD BANK FELLOWSHIPS AT WALTER REED

The first blood bank student fellowship in the department of immunohematology, Walter Reed Army Institute of Research, was awarded in July to First Lieutenant William S. Collins, II, MSC, USA, who recently received a master's degree in bacteriology while stationed at Fitzsimons Army Hospital. A second officer, Major Edgar B. McCord, MSC, USA, blood bank director at USARUER laboratory, Landstuhl, Germany, will report this month.

The fellowship, established to help meet the Army's need for career Medical Service Corps laboratory scientists trained in the technics and problems of blood collection and processing, is a one-year course offering instruction in blood bank operation. The fellows will be under the direction of Colonel Joseph H. Akeroyd, MSC, USA.

LT. COLONEL HARPER TO HEAD ARMY NURSES

Lieutenant Colonel Margaret Harper, NC, USA, became the new chief of the Army Nurse Corps on 1 September, succeeding Colonel Inez Haynes, NC, USA, who retired 31 August to become director of the National League for Nursing in New York.

Colonel Harper, assistant chief of the Army Nurse Corps since September 1955, has been in the Army since 1941. She served in Australia, New Guinea, and Europe during World War II, receiving the Bronze Star Medal and Army Commendation Ribbon for her outstanding performance of duty in Europe. A native of Potomac, Illinois, she is a 1934 graduate of Evanston General Hospital School of Nursing, and received her master's degree in personnel counseling and in nursing service guidance from Columbia University in 1953.

Lt. Colonel Harper

Colonel Haynes began her military nursing career in 1932, when she was commissioned in the Army Nurse Corps Reserve. During World War II, she served in the Pacific Theater, and later with the Eighth Army in Japan. Since 1949, she has served in the office of the Army surgeon general, first in the personnel division, then as deputy chief of the Nurse Corps in August 1955. In October 1955, she became Chief of the Army Nurse Corps. She is a graduate of Scott and White Memorial Hospital School of Nursing, Temple, Texas, and received a degree in nursing education from the University of Minnesota in 1955.

NEW PROFESSIONAL COURSES OFFERED BY ARMY

Two new professional postgraduate short courses have been added to the training program for Army Medical Service officers during fiscal year 1960. One is an advanced orientation course on medical aspects of chemical warfare to be given 5-9 May 1960, at the Army Chemical Center, Edgewood, Maryland. The other is a course in occupational medicine at the U. S. Environmental Health Laboratory, Edgewood, 12-16 October 1959, and 2-6 May 1960. Active and reserve medical officers, National Guard medical service officers, full time civil service physicians at Army installations and certain civilian medical personnel are eligible to attend these courses.

OFFICIAL DECORATIONS

The following awards were recently announced by the Departments of the Army, Navy, and Air Force.

Legion of Merit

Theodore E. Fischer, Col., USAF (DC)
Olin F. McIlnay, Maj. Gen., USAF (MC)**
Harry G. Moseley, Col., USAF (MC)*

Soldier's Medal

Leroy P. W. Froetscher, Capt., USAF (MC)

Bronze Star Medal with Combat "V"

James E. Kicklighter, Lt. (j. g.), MC, USNR

Army Commendation Ribbon with Metal Pendant

Lawrence G. Alexander, Jr., Col., MC, USA
William J. Tiffany, Jr., Lt. Col., MC, USA

Navy Commendation Ribbon with Metal Pendant

Arthur H. Fix, Lt., MC, USNR

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*Posthumous award.
**Second oak leaf cluster.

DEATHS

HOPPER, Edward Bernard, Captain, MC, USN, of Purchase, New York; assigned to U. S. Naval Supply Center, Oakland, California; graduated in 1929 from Yale University School of Medicine, New Haven, Connecticut; appointed a first lieutenant in the Army of the United States 22 April 1936; appointed a lieutenant commander in the United States Naval Reserve 22 April 1943; reported for active duty 14 June 1943; commissioned a commander in the United States Navy 14 August 1946; died 30 June 1959, aged 53, at Vallejos, California, of coronary thrombosis.

LOWE, Donna Sue, Major, AMSC, USA, of Memphis, Tennessee; assigned to Ireland Army Hospital, Fort Knox, Kentucky; graduated in 1931 from Memphis State College, Memphis, Tenn.; Department of the Army civilian dietitian 16 August 1933 to 31 March 1943; appointed a second lieutenant in the Army of the United States 22 March 1943; commissioned a captain in the United States Army 17 January 1948; died 30 June 1959, aged 49, at Fort Knox, of heart disease.

WARNER, Elizabeth, Lieutenant Commander, NC, USNR, of Berkeley, California; assigned to the U. S. Naval Hospital, Philadelphia, Pennsylvania; graduated in 1937 from the School of Nursing, Children's Hospital, Boston, Massachusetts; appointed an ensign in the United States Naval Reserve 17 April 1943; reported for active duty 11 June 1943; died 11 June 1959, aged 49, at the U. S. Naval Hospital, Philadelphia, of cavernous sinus thrombosis.

CORRESPONDENCE

LETTER FROM LAOS

Dr. Thomas Dooley, a former Medical Corps officer in the Naval Reserve, was a prominent participant in the Navy's operation "Passage to Freedom," in which refugees were evacuated from North to South Viet Nam ahead of the Communists. In 1956, after completing his residency in orthopedics, he returned to the Far East as a civilian physician for the International Rescue Committee, and later for Medical International Cooperation (MEDICO). The clinic described in this letter is the third he has organized. Already awarded the Legion of Merit, and Viet Nam's highest award, Officer de l'Ordre National de Viet Nam, *for his work with refugees in Viet Nam, Dr. Dooley's accomplishments will again be recognized when he returns to the United States later this month to receive the Criss Award made by Mutual of Omaha for services in the field of health and/or safety. This award was made last three years ago to Dr. Jonas Salk. Dr. Dooley has described his experiences in the Far East in two books. The first of these,* Deliver Us From Evil, *published in 1956, is about his work in Viet Nam, while* The Edge of Tomorrow, *published last summer by Farrar, Straus and Cudahy, Inc., describes his work in Laos*—Editor.

Muong Sing, June 3, 1959

Dear All of You,

It has been a long time since I've been able to get a letter off to you. But you are in our thoughts and our work each day. Whether we are sticking a lollypop in a child's mouth or a penicillin needle somewhere else, we remember who makes it possible for us to be here. In America this is the time of lilacs. In Laos it is the "nyamfon" or monsoon season, a time of crashing violence. The rains lash the trees and whip the thatched roofs. The winds wail down the valley and the palms bow like acolytes at the confiteor. Last month the tropical night merely whispered, now it roars with fury. The earth is flooded. Nyamfon.

Only occasionally can airplanes land on the sodden strip, so we are more isolated than ever before. But the isolation is only physical, nothing more. We feel the power of your prayers and know your help all of the time. I hope you can hear the echoes of our thanks. Our time goes past fast, minute by second and most by more. We are busy all day and much of the night. Our hospital is small to be sure, but then things don't always depend on size (or a cow would catch a rabbit). The new ward building has "mat" space for 24 patients, though in an emergency we could squeeze in a few more. The Lao Woman's Association down in the capitol sent us 100 blankets for the ward while other Lao organizations sent us the cement and metal used in the building. The three buildings on the compound are connected by thatched covered walkways that we call "rain ramps." This is so we can go from the house to the clinic and ward without getting drenched.

Earl Rhine and Dwight Davis work long and hard. Their's is a simple guide: the best way to achieve one's own happiness is to strive for the happiness of others. They call the old withered gals "young maiden" and the kids are "Mr. Bigger-Eyes-Than-Mine" or more modestly, "Tex." Earl and Dwight have managed to introduce two new phrases into the mountain vocabulary. Every kid in the valley can say "O. K., Bud" and "Com' on." The boys have found an anchor stronger than the earth and moon. The anchor of the human heart. They may not have yet mastered Lao; they have not yet learned all about medicine, but the language of their compassion, understood by all, pours forth its unconscious eloquence. They give much and do not know that they give at all.

We have a little lad at the hospital named Gun Tar. He is a Kha Kho, from over the hills near north Burma. He was badly mauled by a tiger, and the flesh of his left leg hideously mangled. We repaired it, pumped in antibiotics, vitamins, and proteins and he is laying down new tissue already. Though he will have some pretty horrible scars, I think he will regain 80 per cent function. His hill dialect is the hardest of all. It sounds to us (and the Lao too) like a series of grunts and yelps. But Gun Tar speaks more with his eyes than with his mouth. His eyes say grateful things.

The China border, just over there, is a constant reminder of the ulcer of evil that gnaws at the whole free world. Although refugees cannot escape as freely now, those who come tell us of the soggy clumping sounds of communist materialism. The hated Communes are still in force. The basic unit of God's mankind, the family, has been torn into many pieces. Husbands live in one barracks, wives in another, children in another village, cared for by the oldsters. Though the southern tip of the Moung Sing valley where we live can sometimes be a green Shangri-La, glorious in its natural beauty, the northern tip, in China, is a malignant shadowland, glorious in nothing. Filled with agony.

The substations of our hospital in the surrounding villages are being run by our Lao military graduates. Though their work is amateurish by American standards, they do have talent and are raising the health of their respective villages. These intense new corpsmen are sparkling and clean. They are very proud of their newly acquired knowledge. They see "meh penh yats" everywhere...they must possess microscopic vision to be able to see "germs" so readily. We presently have nine students and Earl is their professor. The students are learning and Earl is surviving. Under the circumstances, both of these facts are amazing.

In Ward B we have a 7-year Thai Dam tribes-boy named Tao Koo. He had a scorching fever several months ago. Accompanying it was a severe diarrhea. The family put him to bed and I suppose the village witch doctor incanted something or other. Within two weeks on a diet

of rice and water, the child developed a bed sore. Within a month this had spread until all the flesh from his lower back and buttocks had sloughed off. Over each bony hip he had a dirty ulcer. He became incontinent and this constant soilage only worsened things. He shrank and withered until he was just the shadow of a child. Finally the father brought him to us in Muong Sing, a 3-day walk. Earl and Dwight immediately took the kid to their hearts. And lucky is that boy Tao Koo. They took that little urinoid glob of flesh and washed him with all the tenderness they could muster. With the hearts of men, the hands of women, and a little of the mystery of God, they gently scrubbed his sores, treated and dressed them. The child showed no reaction. He was too sick, too dulled by pain to respond even to this much compassion. They rigged a special bed for him, tying balloons across the cross bars. They pasted pictures to the wall alongside it. They gave him a color book and a little rabbit that squeaked. On the few days that we have sunlight, they bring his bed outside and drape a mosquito net over it. The dressings are removed and the sores aired in the sunlight. About a week after admission Tao Koo's eyes, so bleak with dying, began to brighten a little. His terrified father learned how to treat him, how to feed him properly, bathe him and turn him without injuring what little good tissue was left. The boys rigged a method so his incontinency would not soil everything. This wistful little lad, God's compromise between flower and dung, an interval between birth and death, once again began to live. He began to smile. He would answer questions with a word instead of a whimper. The emaciated skeleton with withered skin is now picking up weight, filling out, and his sores are closing up. He is happy, and definitely the cleanest boy in Asia.

From this table where I'm typing, I can see the ward. The sun is just setting and the boys are putting Tao Koo's bed back in the ward for the night. There is an immense quiet happiness in the faces of the two Americans. There is peace in the faces of the Asians around the compound. There is much beauty in the purple glow of the sunset over the Burman hills.

There is an extraordinary amount of terrible exertion here, danger, some choking futility, and much loneliness. But there also are moments like this, when the chaos and sadness of the day melt into the peaceful silence of the night. My mind can embrace much in the clasp of memory. I remember that my teachers told me Humanity is God on earth. I remember that a doctor's job is to cure sometimes, to relieve often, to comfort always. I remember the strong vine of friendship holding us to you. I remember your constancy in supporting MEDICO. I remember reading Lincoln, "freedom is for all men in all lands, everywhere." I remember just why we are here. And in watching Earl and Dwight care for that little wisp of a lad I am positive that the human spirit can rise supreme; that man can develop the feeling of oneness with other

men. All beings of blood and breath are brothers, here to help one another.

Maybe the dream of Anne Frank is closer than we know: "Things will change, and men become good again and these pitiless days will come to an end and the world will know once more order, rest, and peace."

So long for now,

TOM DOOLEY, M. D.

HONORARY MEMBERSHIP. The Honorable James H. Douglas (left), Secretary of the Air Force, is presented with a certificate of honorary membership in the Aerospace Medical Association by Major General Oliver K. Niess, USAF (MC), Air Force Surgeon General. The Aerospace Medical Association (formerly the Aero Medical Association) annually elects two honorary members for outstanding contributions to the advancement of aeronautics. Lieutenant General Elwood Quesada, USAF (Ret.), administrator of the Federal Aviation Agency, was similarly honored this year.

Progress Notes

Captain **Clifford P. Phoebus,** MC, USN, reported recently to the Bureau of Medicine and Surgery as director of the new Astronautical Division. He attended the Naval War College, Newport, Rhode Island, prior to this assignment. . . . .Colonel **Samuel W. Caldwell,** MC, USA, who recently received a master's degree from the Harvard School of Public Health, has been assigned to Ft. Bragg, North Carolina, as chief of the hospital's preventive medicine division. . . . .Following his graduation in June from a command and staff procedures course at the Army Medical Service School, Fort Sam Houston, Texas, Lieutenant Colonel **Paul M. Gowan,** DC, USA, was appointed deputy dental surgeon of the Fourth Army.

Brigadier General **Henry R. Syndenham,** DC, USA, since 1957, chief of the dental service at Letterman Army Hospital, San Francisco, assumed his new duties as director of dental activities at Brooke Army Medical Center, Fort Sam Houston, Texas, on 1 September. He succeeds Brigadier General **Dale B. Ridgely,** DC, USA, who retired 31 August after more than 30 years' active duty. . . . .The Bethesda (Md.) chapter of the Junior Chamber of Commerce, on behalf of the national organization, recently presented a distinguished service plaque for outstanding professional and scientific accomplishments to Lieutenant Commander **Jeno E. Szakacs,** MC, USN. . . . .Lieutenant Colonel **George F. Rumer,** MC, USA, has been assigned director of the Department of Military Medicine and Surgery of the Army Medical Service School, Brooke Army Medical Center. . . . .Captain **Arthur R. Frechette,** DC, USN, has been elected to the Standing Committee on Civil Defense of the American Association of Dental Schools.

Colonel **Louis S. Leland,** MC, USA, recently was appointed surgeon of the U. S. Army Japan, and commanding officer of the U. S. Army Medical Command, Japan, succeeding Colonel **Charles H. Moseley,** MC, USA, who was reassigned to the Army Medical Service School, Brooke Army Medical Center, Fort Sam Houston, Texas, as head of the department of preventive medicine. Colonel Leland has served as commanding officer, U. S. Army Hospital, Camp Zama, Japan, since 1957. . . . .Captain **Hector J. A. MacInnis,** DC, USN, district dental officer, First Naval District, Boston, Massachusetts, retired recently after 32 years of active duty. . . . .Captain **Robert O. Canada,** MC, USN, formerly at the U. S. Naval Hospital, Oakland, California, has succeeded Captain **John B. MacGregor,** MC, USN, as chief of medicine, U. S. Naval Hospital, Bethesda, Maryland. . . . .Commander **Richard R. Blackwell,** DC, USN,.First Marine Brigade, Fleet Marine Force, Pacific, recently presented a paper before the Hawaii Territorial Dental Society.

Captain **Marion E. Roudebush,** MC, USN, who has served as head of the neuropsychiatric service, U. S. Naval Hospital, Oakland, Cali-

fornia, since 1956, has been reassigned as chief of the neuropsychiatric service, U. S. Naval Hospital, Yokosuka, Japan. . . . .Captain **Robert S. Snyder, Jr.,** DC, USN, is the new dental inspector general, of the Bureau of Medicine and Surgery. His executive assistant is Lieutenant Commander **Robert E. Ricker,** MSC, USN. . . . .Major **Frederic von Lehr,** MSC, USA, recently assumed the duties of chief of the education and training branch at Letterman Army Hospital, San Francisco. He succeeded Captain **Stephen J. Chandler,** MSC, USA, who retired 31 July. . . . .Captain **Mack L. Parker,** DC, USN, has relieved Captain **Robert D. Wyckoff,** DC, USN, as head of the standards and training section, Dental Division, Bureau of Medicine and Surgery. Captain Wyckoff has been assigned as commanding officer, U. S. Naval Dental Clinic, Yokosuka, Japan.

Colonel **Frances I. Lay,** USAF (NC), chief of the Air Force Nurse Corps describes the preparation for space-age nursing in "Next Stop—Outer Space" in the July *American Journal of Nursing,* marking the Corps' 10th anniversary. . . . .Lieutenant Colonel **Elmer R. Pede,** VC, USA, has been appointed post veterinarian at Fort Leavenworth, Kansas, replacing Colonel **Philip R. Carter,** VC, USA, who has retired. Prior to his assignment at Fort Leavenworth, Colonel Pede was veterinarian at Fort Belvoir, Virginia. . . . .Colonel **Lawrence G. Alexander, Jr.,** MC, USA, inspector general of Brooke Army Medical Center since 1958, retired 30 June after more than 29 years of active service. . . . .Captain **Philip J. McNamara,** MC, USN, chief of surgery at the U. S. Naval Hospital, Philadelphia, recently assumed his new duties as executive officer of the U. S. Naval Hospital, Oakland, California. . . . .Colonel **Nelson S. Irey,** MC, USA, chief of the pathology service at Letterman Army Hospital since 1956, was promoted to his present rank in June.

Colonel **William M. Ream,** DC, USA, is the new commanding officer of the Central Dental Laboratory, Brooke Army Medical Center, Fort Sam Houston, Texas. Formerly commander of the Sixth U. S. Army Central Dental Laboratory, Alameda, California, he succeeded Colonel **Maurice Washburn,** DC, USA, who has been assigned to duty in Europe. . . . .Three Army Nurses, Captain **Monserrate Irizarry-Santiago,** Fitzsimons Army Hospital, Denver, Colorado; and First Lieutenants **Erla J. Freidhoff** and **Shirlee E. Owens,** Ireland Army Hospital, Fort Knox, Kentucky, and William Beaumont Army Hospital, El Paso, Texas, respectively, are recent graduates of the first class in basic operating room technic at Martin Army Hospital, Fort Benning, Georgia. . . . . Captain **George C. Rader,** DC, USN, assistant head of the planning and analysis branch, Dental Division, Bureau of Medicine and Surgery, has been confirmed as a consultant to the specifications committee of the dental materials group of the International Association for Dental Research.

"Identical Bilateral Oral Carcinoma," a case report by Captain **Theodore A. Lesney,** DC, USN, chief of the dental service, U. S. Naval

Hospital, San Diego, appeared in the July issue of *Oral Surgery, Oral Medicine and Oral Pathology*. . . . .Captain **Sidney L. Arje,** MC, USN, has reported for duty as head of the planning and special projects section, Bureau of Medicine and Surgery, from the U. S. Naval Hospital, Camp Pendleton, California. . . . .Lieutenant Colonel **Agnes P. Snyder,** AMSC, USA, chief of the physical therapy branch, Army Medical Service School, Brooke Army Medical Center, was principal speaker at a meeting of the Coastal Bend District, Texas Chapter of the American Physical Therapy Association on 15 July.

Captain **Hilton E. Rose,** MC, USN, commanding officer of the Naval Hospital at Quantico, Virginia, since June 1956, recently reported for duty as inspector general of medical department activities, Bureau of Medicine and Surgery. . . . .Lieutenant **Robert J. Hanavan,** MSC, USN, aide and executive assistant to the deputy surgeon general of the Navy since 1955, has succeeded Commander **Herman B. Tidwell,** MSC, USN, who retired 1 July, as administrative officer at the National Naval Medical Center, Bethesda. . . . .Major **Joy B. Crain,** NC, USA, educational coordinator at Letterman Army Hospital, who retired from active duty 30 June after more than 16 years of active duty, plans to return to do volunteer social work.

Colonel **William L. Keller,** USA (Ret.) 85, distinguished surgeon and lifetime consultant to Walter Reed Army Hospital, died July 10. Assigned to the hospital in 1919, his 16-year tour of duty in Washington was marked by several new and outstanding surgical procedures. In 1935, when he retired after a 35-year military career, Congress passed special legislation making him a lifetime consultant with full pay and allowances. . . . .The Decoration for Exceptional Civilian Service, the Army's highest civilian award was presented in July to Dr. **Van M. Sim,** chief of the Chemical Warfare Laboratories' clinical research division, Edgewood, Maryland, for volunteer work in testing new chemical agents. A 1944 graduate of the University of St. Louis School of Medicine, Dr. Sim served in the Navy Medical Corps during World War II and the Korean conflict. . . . .Lieutenant Colonel **James B. Hartgering,** MC, USA, was recently awarded the Walter Reed Certificate of Achievement in recognition of his work as deputy chief and later chief of the division of nuclear medicine and biochemistry for the past five years. He is now chief of the biological and medical science branch, Office of Research and Development, Army Medical Service, Research and Development Command.

Colonel **James T. McGibony,** MC, USA, is the new chief of medical plans and operations in the office of the Army surgeon general, succeeding Colonel **Angel A. Cardona,** MC, USA, now surgeon of the Military District of Washington. . . . .Lieutenant Colonel **Gordon F. Fisher,** USAF (MC), has been assigned as chief of the preventive medicine division, office of the Air Force surgeon general, replacing Colonel **George K. Fair,** USAF (MC), now medical member of the physical evaluation board at Andrews Air Force Base, Washington, D. C.

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A Message From the A. M. A.

Among the major subjects which brought important policy actions by the House of Delegates at the 108th Annual Meeting of the American Medical Association in Atlantic City last June were the report of the American Medical Association Commission on Medical Care Plans, relations between medicine and osteopathy, the report of the Committee on Preparation for General Practice, and the issue of compulsory social security coverage for self-employed physicians.

The House received the report of findings, conclusions, and recommendations of the Commission on Medical Care Plans as information only and then acted upon the recommendations item by item. Strongly endorsed was the recommendation that:

> Those who receive medical care benefits as a result of collective bargaining should have the widest possible choice from among medical care plans for the provision of such care.

The following statement of policy on freedom of choice of physicians was adopted:

> The American Medical Association believes that free choice of physician is the right of every individual and one which he should be free to exercise as he chooses. Each individual should be accorded the privilege to select and change his physician at will or to select his preferred system of medical care and the American Medical Association vigorously supports the right of the individual to choose between these alternatives.

In considering a special report of the Judicial Council on the subject of osteopathy, the House adopted the following policy statement regarding interprofessional relations:

> (A) All voluntary professional associations between doctors of medicine and those who practice a system of healing not based on scientific principles are unethical.
>
> (B) Enactment of medical practice acts requiring all who practice as physicians and surgeons to meet the same qualifications, take the same examinations and graduate from schools approved by the same agency should be encouraged by all the constituent associations.
>
> (C) That it shall not be considered contrary to the Principles of Medical Ethics for doctors of medicine to teach students in an osteopathic college which is in the process of being converted into an approved medical school under the supervision of the A. M. A. Council on Medical Education and Hospitals.

From the Council on National Defense of the American Medical Association. The views and opinions expressed are not necessarily those of the Department of Defense. —*Editor*

(D) A liaison committee be appointed by the Board of Trustees of the American Medical Association to meet with representatives of the American Osteopathic Association, if mutually agreeable, to consider problems of common concern including inter-professional relationships on a national level.

The House approved and commended the final report of the Committee on Preparation for General Practice, which proposes a new 2-year internship program for medical school graduates planning to become family physicians. The Committee included representatives from the A. M. A. Council on Medical Education and Hospitals, the American Academy of General Practice and the Association of American Medical Colleges. The suggested program would include a basic minimum of 18 months' hospital training in the diagnostic, therapeutic, psychiatric, preventive and rehabilitative aspects of medicine and pediatrics in a very broad sense, including care of the newborn. A physician then could elect to spend the remaining 6 months for additional training in other segments of the program. However, participants who plan to practice obstetrics would be expected to spend at least 4 months of the elective period in obstetrical training.

With respect to the subject of compulsory social security coverage for self-employed physicians, the House adopted a resolution reaffirming its opposition to the compulsory inclusion of physicians. The House recognized "the apparent growing demand by physicians for economic security" and requested the Board of Trustees to investigate the possibilities of developing group insurance and retirement plans which could be made available to Association members.

Of particular interest to physicians in the military service is the reaffirmation by the House of Delegates of its position recommending the establishment of general or flag officer rank for the Director of the Armed Forces Institute of Pathology during his tenure of office. The House also expressed its appreciation for the outstanding disaster medicine program presented by the United States Army Medical Service on 6 June 1959 at the seventh National Medical Civil Defense Conference which is sponsored annually by the A. M. A. Council on National Defense.

Among a wide variety of other actions, the House of Delegates: decided that every government program which has implications of or might lead to socialized medicine should be scrutinized with great care before the profession enters into any such program; determined that the Association forcefully bring to the attention of its legislative representatives the importance of differentiation of funds for services of physicians and dentists from funds for drugs, nursing care, hospitalization and other ancillary services and that the Association work to incorporate this policy of differentiation of funds in any legislation which does not specify the amount or portion of funds for physician and dentist services and request state and local societies to

adhere to this principle and implement it at all levels; agreed to expend every effort to revise the wording of legislative acts to the effect of providing for payment or reimbursement of medical expenses rather than "providing medical services" as some statutes are worded, in that the government does not, in fact, provide medical service, and to request state and local societies to adhere to this principle and implement it at all levels; recommended that state medical societies, where advisable, initiate legislative efforts to eliminate cancer quackery; approved the inclusion of *Today's Health* and any one of the specialty journals chosen as benefits to dues-paying members, who will continue to receive *The Journal of the American Medical Association* and the *AMA News* as a benefit of membership; urged all physicians to participate more fully in community activities and socioeconomic matters in their own communities, but agreed that no change should be made at this time in Article II of the Constitution which states the Association's objectives; reaffirmed its position of opposition to payment of residents-in-training for medical services; approved in principle the aims and objectives of the President's Council on Youth Fitness and Citizens Advisory Committee on the Fitness of American Youth; requested the Board of Trustees to study the problems and possibilities of establishing an A. M. A.-sponsored medical scholarship and/or loan program; received a progress report indicating "phenomenal progress" in the field of health insurance coverage for the aged since the Minneapolis meeting last December; reaffirmed its full support of the Educational Council for Foreign Medical Graduates; expressed heartfelt thanks to the Committee on Amphetamines and Athletics, which has completed its assignment; endorsed the traffic safety postage stamp proposal as a means for stimulating in American motorists an awareness of the necessity for safe driving; and urged every A. M. A. member to give a substantial gift to the medical schools through the American Medical Education Foundation.

USA OFFICER PLANS ROK MEDICAL PROGRAMS

Three key medical programs, which were developed by Colonel Santino J. Lerro, MC, USA, have been adopted by the Republic of Korea Army Medical Service. Colonel Lerro was senior medical advisor to the Republic of Korea Army from 23 January 1958 to 30 May 1959. The programs concerned are the tuberculosis control program, the intern and resident deferment plan, and the bilingual sanitary guide. Colonel Lerro recently received the Commendation Ribbon with Metal Pendant for his accomplishments. He became chief of professional services for the new Army hospital at Okinawa, the first of this month.

Book Reviews

ATOMIC MEDICINE, edited by *Charles F. Behrens*, M. D., F. A. C. R. 3d edition. 705 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., 1959. Price $15.

Six years have elapsed since the last edition of this review of a multiphasic and rapidly expanding field was published. The new edition accordingly is justified, and extensive care and reworking have gone into its preparation. The list of contributors includes many distinguished members of and consultants to the national military establishment and, generally, the quality of their writing is very nearly comparable to the excellence of their technical knowledge. The work embodies, unfortunately, a somewhat cumbersome system of numerical paragraphing. The 24 chapters can be broken down into several broad subdivisions: nuclear physics, including radiobiology and instrumentation; bomb effects, both immediate and fallout; radiation protection; and clinical and research applications of radioisotopes. The illustrations and diagrams are excellent. This book should prove of especial interest to the health physicist and bomb-project medical officer.

—*WALTER G. GUNN, Capt., MC, USA*

DISEASES OF THE COLON AND ANORECTUM, Volumes I and II, edited by *Robert Turell*, M. D. 1,238 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $35 for set of two volumes.

These two volumes, written by 82 collaborators under the editing supervision of Robert Turell, M. D., who also contributed several chapters, is encyclopedic in content. The text covers all aspects of medical and surgical lesions of every type from the cecum to the pilonidal area. The authors include many who are internationally known and all are well qualified. One particularly interesting chapter is contributed by Edith Lenneberg, the editor of the *Ileostomy Quarterly*, on the ileostomy patient's point of view. Pre- and post-operative care, complications of surgery, physiology of the colon, and fluid balance problems are considered separately.

The content is logically arranged in parts, sections, and chapters with diseases in one category, such as functional disturbances, being considered in one section of three chapters devoted to different aspects of the problem. The volumes are well edited, authoritatively written, and the references and suggested collateral reading at the end of each chapter are current. In the chapter on parasitic and protozoan infections, however, pictorial representations of the organisms are not included. The volumes contain 634 figures.

I have never seen a better presentation of the subject than is in these two volumes. They are recommended to any physician who treats diseases of the colon, anus, or pilonidal area, both for reference and for study. The work is a must for medical libraries.

—*DAVID E. THOMAS, Lt. Col., MC, USA*

PERSONALITY CHANGE AND DEVELOPMENT. As Measured by the Projective Techniques, by *Molly Harrower*, Ph. D. 383 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., 1958. Price $10.

This book reports on a 15-year study wherein data on approximately four thousand patients were accumulated and reviewed. The major contribution of the volume is not the quantity of patients examined but rather the longitudinal aspects of personality evaluation through the use of projective technics. At least fifty of the patients were re-examined on request of the original referrer and others were recalled for evaluation. The report on these formed the core of the study. Good information of longitudinal study type is sparse in the area of projective technic usage, thus making this volume one of particular value. The book includes a good statement of need for follow-up studies as well as for more precise descriptions of personality dynamics. Also, there is an efficient summary of current thinking on problems of re-evaluation with editorial comment on various findings and opinions. Although Rorschach was the predominant projective technic employed others were included in various phases of the study. These included the Szondi, thematic apperception test, draw-a-person, sentence completion test, and children's apperception test. Over-all evaluations by various psychotherapists are included both for "successfully" and "unsuccessfully" treated patients. This is a book which is recommended for the reference shelf of the clinical psychologist and for the use of graduate students at the intern level of training in the field of clinical psychology.—*FREDERICK A. ZEHRER, Col., MSC, USA*

LESIONS OF THE LOWER BOWEL, by *Raymond J. Jackman*, M. D., M. S. in Proctology. 347 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $15.50.

This volume is an especially valuable proctologic textbook because it is concerned almost entirely with diagnosis of anorectal and sigmoid diseases. It, therefore, complements other similar texts which are devoted to therapeutics. Logically, Dr. Jackman begins with very worthwhile though brief chapters on anatomy and physiology covering intramural, internal, and external structures of the lower colonic area. He then turns to the details of diagnostic technics, especially proctoscopy and transrectal biopsy. In succeeding chapters he discusses the differential diagnosis of ulcerations of the mucosa, intramural tumors, extrinsic lesions which invade the colon, extrarectal masses, retrorectal tumors, transanal bleeding, anorectal pain, and anal and perianal skin lesions. One of the outstanding diagnostic aspects of this volume is the large number of exceptional color photographs, mostly taken through the proctoscope or sigmoidscope. There is no better way of getting a diagnostic point across than by the use of color photography. Every clinician will find Dr. Jackman's book of value, be he general practitioner, surgeon, internist, proctologist, or gastroenterologist. His vast knowledge and experience are nicely recorded for the benefit of others. —*LESTER J. POPE, Capt., MC, USN*

CURRENT THERAPY—1959, Latest Approved Methods of Treatment For the Practicing Physician, edited by *Howard F. Conn*, M. D., with 12 consulting editors. 781 pages. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $12.

This eleventh annual edition of *Current Therapy* meets the high standards set by the editor of the previous volumes. The number of contributors has been increased to 305, and are of sufficient stature to speak with authority. The 12 consulting editors are the same as of the previous edition.

The book is divided into 16 sections and composed of 781 pages including infectious diseases, the various body systems, allergy, and physical and chemical injuries. It presents the "method of therapy" of an individual authority, for each included morbid condition. For the most part each condition is presented in a clear and concise fashion, and includes both principles and details of methods. The format and indexing are of such a nature as to make all of its contained information of finger-tip availability. Covering as it does practically all phases of therapeusis in the entire spectrum of medical sciences, a single volume can only present one "method" for each entity. It is inherent in such a concept that some presentations will be didactic. Some statements are made to which reasonable exception might be taken by the reader. For example, emetine is offered as the first drug of choice for the routine treatment of extraintestinal amebiasis; and for bites of poisonous snakes (American pit-vipers), incisions and strong suction are unequivocally recommended. The preface states that the topics have been rotated among contributors at the request of readers who wished to have access to other treatment methods. There is still only one method in this volume, however. For other methods, previous editions must be consulted. In fairness, these criticisms are rather minor, and detract little from the real value of the book. Of special use are tables of poisonous substances in common household items, and of active ingredients in various commercial products. New in this edition are tables of normal laboratory values of clinical importance in the inside of the front and back covers.

—*JAMES L. SPENCER, Capt., MC, USN*

THE ANATOMY OF THE NERVOUS SYSTEM, Its Development and Function, by *Stephen Walter Ranson*, M. D., Ph. D.; revised by *Sam Lillard Clark*, M. D., Ph. D. 10th edition. 622 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $9.50.

The tenth edition of this text of neuroanatomy has additional pages and fewer illustrations, but still retains its portability in terms of weight and its readability in terms of length. Despite its newness, the work retains most of its original illustrations and format. The most notable change is that which occurs in an expansion of the table of contents so that the subject is much more easily discovered. This change in the table of contents is not comparably reflected in the book itself. Most of the subject material has been in previous volumes but not so extensively itemized. Over the years another change is that the

newer illustrations have tended to be in the form of diagrams with less of an attempt to approximate actual specimens. Although this adds clarity, this kind of elaboration can be afforded only because the original illustrations were such close replicas of actual specimens. The vascular system remains in the first few chapters, presumably in keeping with current problems of cerebrovascular disease (this change occurred actually in the eighth edition). The bringing up to date of the book is really in the form of minor additions here and there. For example, there are a few more words on the reticular formation in two separate chapters. Another illustration might be that although the parts on the hypothalamus have been gradually expanded over the years, there is little change from recent editions. It would imply to this reviewer that the lack of need for great changes means that most of the material has been pretty fundamental. This book is one of the very best of its class. A tendency for relative dearth of clinical correlation is to be commended. There is still room for the study of neuroanatomy as a subject; thereby an indispensable foundation for neurology is laid.—*WARREN E. PORTER, Maj., MC, USA*

SURGERY OF THE SYMPATHETIC NERVOUS SYSTEM, by Professor Sir *James Paterson Ross*, K. C. V. O., LL. D., M. S., F. R. C. S., F. R. A. C. S., F. A. C. S. 3d edition. 170 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1959. Price $8.

This is the third edition of a well-established book on the surgery of the sympathetic nervous system. It is written in a clear style which is easy to read and comprehend and will prove especially valuable as a guide to the indications for surgery of the sympathetic nervous system. Special enjoyment is provided by anecdotes of medical history throughout the various chapters. The views on causalgia, from those of Percivall Pott to Weir Mitchell, are enlightening. Whereas the previous edition mentioned sympathectomy as a successful treatment of shortening of the paralyzed limbs secondary to anterior poliomyelitis, this volume sheds doubt that the length of the affected limb has been improved appreciably by operation. A similar about-face has been made in the treatment of chronic arthritis. The second edition states that sympathectomy is established as a treatment for chronic arthritis. The present book expresses the belief that the results of operation have been disappointing. These are but two examples given to point out the changing concepts reached in wide surgical experience and long clinical follow-up of patients. The three editions of this book form an evolutionary history of the surgery of the sympathetic nervous system, and the present edition is a culmination of a vast amount of experience in this field. The book contains six chapters. One, dealing with the treatment of arterial hypertension, and another with hyperhydrosis, are topics not included in previous editions. The format and illustrations of this book have been improved. The bibliographies at the conclusion of each chapter have not been brought up to date with the present edition. This book is recommended to all those interested in the surgery of the sympathetic nervous system.

—*JOHN B. MOYAR, Maj., MC, USA*

THE EFFECT OF ADVANCING AGE UPON THE HUMAN SPINAL CORD, by *L. Raymond Morrison*, M. D., with the collaboration of *Stanley Cobb*, M. D., and *Walter Bauer*, M. D. 127 pages; illustrated. Harvard University Press, Cambridge 38, Mass., 1959. Price $6.

To study the effects of disease upon the spinal cord, one must know the normal variations in association with age that may occur in the cord. This unique book provides the necessary background by reporting the results of a study in a series of 31 spinal cords from the second through the ninth decade. The latter part of the book contains an atlas of a normal spinal cord in transverse sections. It is correlated with the cell columns described by Harry C. Elliott, accompanied by references pertinent to the subject. About the fourth decade, lesions resulting from age become manifest in a fairly constant manner, e.g., diffuse thinning of posterior column myelin sheaths and proliferation of the central canal ependyma occur. In the fifth decade, corpora amylacea are found at the posterior column edges and the anterior horn cells commence chromotolysis as well as hyperchromatic processes. These and other changes become more pronounced with increasing years. The book is concluded with an excellent summary of the findings for the various decades. The photographs, and particularly the microphotographs, are commendable. This book reflects the scientific zeal of the late Dr. Morrison. It should be in all libraries serving neuropathologists.—*ARTHUR J. LEVENS, Lt. Col., MC, USA*

NEUROLOGICAL AND PSYCHOLOGICAL DEFICITS OF ASPHYXIA NEONATORUM, with consideration of Use of Primates for Experimental Investigations, edited by *William F. Windle*, Ph. D., Sc. D., with 28 contributors. 336 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $8.

In September 1956 clinical investigators, and those primarily concerned with animal research, participated in a symposium on perinatal factors causing brain damage and learning impairment in San Juan, Puerto Rico. Clark J. Bailey, Ph. D., surveying the present interrelationship of asphyxia neonatorum, cerebral palsy and mental retardation, concluded that further definitive clinical studies and controlled animal experiments were required. Some of the highlights of the symposium were as follows: A thought-provoking discussion with practical implications was given by James O. Miller, Jr., Ph. D. From his and his associates' work, primarily in guinea pigs, it seemed that hypothermia, intraperitoneal sodium pentobarbital in conjunction with hypothermia, hydrogen peroxide intraperitoneally as an oxygen source and ATP intraperitoneally as an anaerobic energy source, all enhanced asphyxial survival. The neuropathologist, Jan Cammermeyer, M. D., pointed out the complexities in neuropathologic study of asphyxia neonatorum and also presented four possible mechanisms in the pathogenesis of cerebral anoxia during childbirth. Marisa I. Robert de Ramirez de Arellano, Ph. D., M. D., reviewed some pilot study results of clinical material available in Puerto Rico. She indicated that in the absence of obvious clinical evidence such as palsy, psychologic tests

and electroencephalography often may demonstrate brain damage. The last part of the symposium was devoted to discussions on the raising, care and behavior of monkeys—apparently considered most appropriate for future animal research in the area covered by this symposium. The published symposium has an excellent bibliography, and is well indexed. For those who wish to keep abreast of research progress in cerebral palsy and closely related fields, this book may be most helpful. —*ARTHUR J. LEVENS, Lt. Col., MC, USA*

OUTLINE OF FRACTURES, including Joint Injuries, by *John Crawford Adams*, M. D., F. R. C. S., 2d edition. 268 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md. 1958. Price $6.50.

The author presents a conservative approach based on sound principles but does not hesitate to advocate surgery when it offers distinct advantages. The material is presented in a common-sense manner without blind adherence to rigid precepts. Excellent summaries of treatment are included at the end of major sections for ready reference. The diagrams are instructive and the x-ray reproductions well chosen. A few points are open to question. In children's fractures, overgrowth of a bone from stimulation may be as significant clinically as residual shortening and length discrepancy may be more than "slight." Comparison x-rays in children's fractures, especially the elbow, should be emphasized. The use of oblique transfixation screws for spiral or oblique fractures of the tibia is debatable. The screw might better be placed at right angles to the bone shaft to avoid shearing stresses. The use of slotted plates in certain types of fractures should be mentioned. The author advocates early mobilization after joint injuries. This should be done with great discretion, depending upon the extent of the injury and the joint involved. In the treatment of spine compression fractures, I disagree with a three-month period of immobilization in *full* extension. One might quibble over fixation of acromioclavicular dislocations with a pin or wire placed across the joint, reduction of shoulder dislocations with the dangerous Kocher maneuver, institution of active movements "a few days" after acute shoulder dislocation, excision of a distal ulnar fragment when the fracture is 3 inches proximal to the wrist joint, a "below elbow" plaster with the wrist in neutral position for immobilization of a Colles' fracture, and the questionable merit of simple excision of the avascular fragment in a carpal scaphoid fracture. Mention might have been made of the benign procedure of radial styloidectomy in nonunion of the carpal scaphoid and the "hanging cast" method of treatment for humeral fractures. The reviewer heartily endorses the use of "open" and "closed" fracture terminology, the term "posttraumatic ossification" instead of the misnomer "myositis ossificans," and the thought that physical therapy "should supplement, not supplant the patient's independent efforts," and the proposed total excision of the cartilage in knee meniscus injuries. The text is highly recommended for the purpose intended. —*EARL W. BRANNON, Col., USAF (MC)*

RECENT STUDIES IN EPIDEMIOLOGY, edited by *J. Pemberton*, M. D., M. R. C. P., D. P. H., and *H. Willard*, M. D. 203 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $5.75.

This small volume reports 18 epidemiologic studies presented to the Study Group on Current Epidemiological Research meeting in Holland in September 1957. Although reports were primarily presented as a vehicle for discussion of the epidemiologic approach and method, each of them is a most interesting dissertation on one or more facets of epidemiology.

Doll's report on cancer in nickel workers is classical in procedure and form and well illustrates the use of existing records in epidemiologic studies. The other four reports in this section on utilizing existing records nicely display variations of the classical technic. The chapter on "Ad Hoc Field Surgery—Getting Your Own Data," has five thought-provoking studies. Studying disease in families, Robert Cruickshank presents some interesting data on the introduction and spread of respiratory disease; Raska, using similar technics, makes several original observations on infectious hepatitis as a communicable disease of families. E. K. Cruickshank presents far too brief accounts of three unusual non-infectious diseases seen in Jamaica. His explanation of "vomiting sickness," "veno-occlusive disease of the liver," and his introduction to the epidemiology of an unsolved neurologic problem are fascinating. The other chapters deal with the application of the epidemiologic method to the evaluation of health needs and services and to general practice. Scattered in the previously indicated chapters are investigations of both communicable and non-communicable diseases.

This is not a book to be read rapidly but one to be perused at leisure. Each report should be thoroughly digested, savoring the nuances of the author's method and following with him his analyses and conclusions. It is an essential volume for preventive medicine personnel and is recommended reading for all personnel. All of the reports contain interesting and thought-provoking observations and many of them will stimulate constructive thinking on several military medical problems.—*LOUIS C. KOSSUTH, Col., USAF (MC)*

DIFFUSE LESIONS OF THE STOMACH, An Account with Special Reference to the Value of Gastric Biopsy, by *Ian J. Wood*, M. D., F. R. C. P., F. R. A. C. P., and *Leon I. Taft*, M. B., B. Sc. 86 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md. 1959. Price $6.

In 1949 Wood developed and described a flexible gastric biopsy tube which permits blind, painless, rapid and safe removal of small fragments of mucosa from the stomach. The principle of sucking a knuckle of mucosa into a chamber, then amputating it by pulling a knife blade past the hole, has been employed by almost all subsequent apparatus for blind biopsy of intestinal mucosa, including the Shiner tube for duodenal and jejunal biopsy and the Crosby capsule for small bowel

biopsy. The authors and their associates at the Royal Melbourne Hospital have performed 1,736 successful biopsies on 1,046 patients. The only complication of the procedure has been hemorrhage in 10 patients, with only two requiring transfusion. There were no fatalities. This experience with gastric mucosal biopsy is described and individual chapters are devoted to acute gastritis, chronic gastritis, diffuse giant hypertrophic gastritis, and gastric atrophy. Other technics for examination of the stomach were employed, but even gastroscopy failed to reveal abnormalities in as many as 50 per cent of patients with biopsy evidence of gastritis. The authors believe gastric mucosal biopsy to be of value in determining the cause of chronic dyspepsia when neither the x-ray nor gastroscopy reveals an ulcer or cancer, and recommend its use in chronic iron deficiency anemia, subacute combined degeneration of the cord, and in achlorhydria. The authors' conclusions are summarized on page 52: "It is our opinion that the acceptance by physicians and surgeons of chronic gastritis as a real disease entity with specific symptoms and signs is essential to the efficient practice of medicine." Few people have had such extensive experience with biopsy material as Dr. Wood, but even these few do not entirely agree with this statement. Among the rest of us there is also a strong skepticism concerning the clinical importance of chronic gastritis. The book is well done and this work must be considered by all who investigate or treat patients with stomach disease.

—BENJAMIN H. SULLIVAN, Jr., Col., MC, USA

EMERGENCY SURGERY, by *Hamilton Bailey*, F. R. C. S. (Eng.), F. A. C. S., F. R. S. E. 7th edition. 1,197 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $32.50.

The new edition of this well-known work has been revised and brought up to date. The book is divided into sections, the largest of which deals with the abdomen. There are also discussions of general measures, eye, ear, nose, and throat, thorax, head and neck, extremities, and tropical emergencies. The section on the genitourinary tract is especially thorough. Because there are many excellent books devoted to fractures, simple closed fractures are not discussed. An appendix includes additional data on some finer points as well as additional excerpts from the recent literature.

The style is very readable and the author's years of surgical experience are reflected in the wealth of information the book contains. Because it is written for the junior surgeon, each subject is covered in great detail and even the more experienced surgeon will find much of interest and of value. The sections on the subspecialties may be particularly welcome to those who have not had experience in these fields. Much of the surgical equipment and supplies described are manufactured in England. It was a little disconcerting, however, to find the size of some organs indicated by comparison rather than by metric measurements.—*PHILIP D. CRONEMILLER, Capt., MC, USN*

THERAPEUTIC RADIOLOGY, Rationale, Technique, Results, by *William T. Moss,* M. D. 403 pages; illustrated. C. V. Mosby Company, St. Louis, Mo., 1959. Price $12.50.

Unlike many texts of radiotherapy, this new book does not present a standard therapeutic technic for each disease process, but rather discusses the philosophy of radiation therapy as it applies to these problems. Its intent is achieved in that it gives the reader a broad foundation from which a sound and logical approach to the treatment of the individual patient may be developed. The recent literature as well as the author's extensive experience are coordinated to produce an easily read, highly informative volume. Comparisons are carefully made with the results of competing and combined forms of therapy when the available series of cases are of similiar composition. The book contains 20 chapters, each of which is devoted to a single anatomic system. The response of the normal tissues of each system is discussed at the beginning of the chapters. The advantages of supervoltage therapy are discussed where applicable. No attempt has been made to cover the field of radioisotope therapy inasmuch as so many excellent textbooks on the subject are now available. This book will be used by all radiologists but it will be of special value to the young radiotherapist in his formative years.

—*MATTHEW F. YENNEY, Lt., MC, USN*

GEOGRAPHIC OPHTHALMOLOGY, edited by *William John Holmes,* M. D. 293 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $8.50.

The title of this book is aptly utilized to bring together articles about both eye diseases which are characteristically prevalent in remote areas and technics used in other countries which are not generally used here. In our present contracting world, areas that were once considered to be remote are but a few hours away from us by jet plane. This fact, coupled by an increased travel both by our own citizens and citizens of other areas of the earth and by our far-flung military installations, warns us to be on the lookout for ocular diseases of which we might otherwise not be cognizant. The initial chapter constitutes a challenge to the leaders in ophthalmology to expand the field of practice to remote areas and to tie the practice of teaching and research closer to a world-wide common pool of knowledge. With the exception of a very few rare and definitely localized diseases, like onchocerciasis, a microfilarial disease, the great ocular plagues such as leprosy, trachoma, and malaria are endemic all over the world and are only subjugated in civilized regions by constant vigilance. This book is well worth reading and adding to the ophthalmologist's library, even if only to remind him of the continued presence among our patients of eye diseases that we have reduced to a minimum, but have not totally eradicated, and which may appear in our offices and clinics unexpectantly. —*KARL D. MacMILLAN, Col., MC, USA*

New Books

Books received by the *U. S. Armed Forces Medical Journal* are listed in this department for the information of readers, and as acknowledgement and appreciation of their receipt from the publishers. Those of greatest interest will be selected for review in a subsequent number of the *Journal.*

THE CLINICAL EVALUATION OF NEW DRUGS, edited by *S. O. Waife*, M. D., F. A. C. P., and *Alvin P. Shapiro*, M. D., with 14 contributors. 233 pages. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N. Y., 1959. Price $7.

THE GREAT PULSE, Japanese Midwifery and Obstetrics through the Ages, by *Mary W. Standlee.* 192 pages; illustrated. Charles E. Tuttle Company, Rutland, Vermont, 1959. Price $4.50.

NOTES OF A SOVIET DOCTOR, by *G. S. Pondoev*, Honored Physician of the Georgian SSR. Introduction to the English translation by *Iago Galdston*, M. D., F. A. P. A. 238 pages. Consultants Bureau Inc., Book Division, New York, N. Y., 1959. Price $4.95.

A SYMPOSIUM ON MOLECULAR BIOLOGY, edited by *Raymond E. Zirkle.* 348 pages; illustrated. The University of Chicago Press, Chicago, Ill., 1959. Price $7.50.

THE MEANING OF POISON, by *Lloyd G. Stevenson*, M. D. 7th series, Logan Clendinging Lectures on the History and Philosophy of Medicine. 53 pages. The University of Kansas Press, Lawrence, Kans., 1959. Price $2.

THE RELATION OF PERFORMANCE TO SOCIAL BACKGROUND FACTORS AMONG ARMY INDUCTEES; a dissertation, submitted to the Faculty of the National Catholic School of Social Service of the Catholic University of America, by *Francis J. Ryan*, M. S. W. 124 pages. The Catholic University of America Press, Washington, D. C., 1958. Price $1.50.

BEHAVIOR PROBLEMS OF CHILDREN IN NAVY OFFICERS' FAMILIES as related to social conditions of Navy family life. A dissertation, submitted to the Faculty of the National Catholic School of Social Service of the Catholic University of America, by *Genevieve Gabower*, B. A., M. A. 279 pages. The Catholic University of America Press, Washington, D. C., 1959. Price $3.

METALS AND ENGINEERING IN BONE AND JOINT SURGERY, by *Charles Orville Bechtol*, M. D.; *Albert Barnett Ferguson, Jr.*, M. D., and *Patrick Gowans Laing*, B. S., F. R. C. S. 186 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1959. Price $8.

SCHIZOPHRENIA, An Integrated Approach, edited by *Alfred Auerback*, M. D. 224 pages; illustrated. The Ronald Press Company, New York, N. Y., 1959. Price $5.50.

PROGRESS IN HEMATOLOGY, Vol. II, edited by *Leandro M. Tocantins*, M. D., with 19 contributors. 290 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., 1959. Price $9.75.

TRAUMA, by *Harrison L. McLaughlin*, M. D. 784 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $18.

A SYNOPSIS OF PHARMACOLOGY, With Special Application to Dentistry, by *V. C. Sutherland*, Ph. D. 267 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $4.

THAT THE PATIENT MAY KNOW, An Atlas for Use by the Physician in Explaining to the Patient, by *Harry F. Dowling*, M. D., Sc. D., and *Tom Jones*, B. F. A., assisted by *Virginia Samter*. 139 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $7.50.

THE ART, SCIENCE AND SPIRIT OF NURSING, by *Alice L. Price*, R. N., M. A. 2d edition. 864 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $5.50.

HYPERTENSION, The First Hahnemann Symposium on Hypertensive Disease, edited by *John H. Moyer*, M. D., with 6 contributors. 790 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $14.

RADIATION THERAPY, by *Walter T. Murphy*, M. D. 1,140 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $25.

TEXTBOOK OF PEDIATRICS, edited by *Waldo E. Nelson*, M. D., D. Sc., with the collaboration of 81 contributors. 7th edition. 1,462 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $16.50.

AN ATLAS OF NORMAL RADIOGRAPHIC ANATOMY, by *Isadore Meschan*, M. A., M. D., with the assistance of *R. M. F. Farrer-Meschan*, M. D., M. D., M. B., B. S. 2d edition. 759 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $16.

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION, Vol. 50., 1958. compiled by *George G. Stilwell*, A. B., M. D. 791 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $13.

PHYSIOLOGY OF MOTION, Demonstrated by Means of Electrical Stimulation and Clinical Observation and Applied to the Study of Paralysis and Deformaties, by Dr. *G. B. Duchenne*. Translated and edited by *Emanuel B. Kaplan*, M. D. 612 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $11.

CEREBRAL ANGIOGRAPHY IN THE MANAGEMENT OF HEAD TRAUMA, by *Charles A. Carton*, M. D. American Lecture Series, Publication No. 336, A Monograph in The Bannerstone Division of American Lectures in Surgery, edited by *Michael E. DeBakey*, M. D., and *R. Glen Spurling*, M. D. 157 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $7.

A MANUAL OF BANDAGING, STRAPPING AND SPLINTING, by *Augustus Thorndike*, M. D., F. A. C. S. 3d edition. 153 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1959. Price $2.75.

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